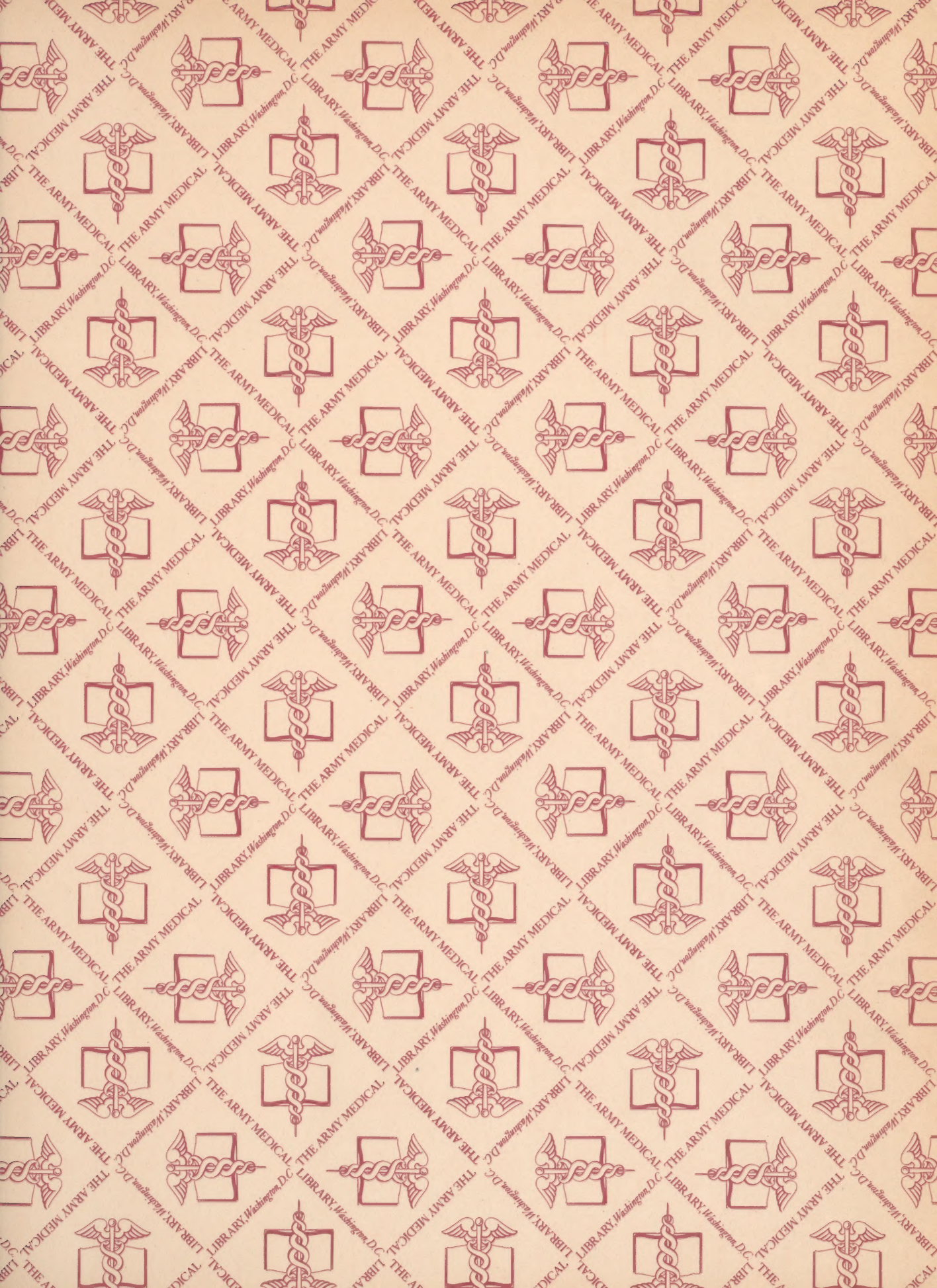
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SURGICAL NURSING

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INDEX FOR NURSING

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Chapter I
SURGICAL NURSING

The qualifications necessary for those upon whom falls the nursing care of the sick or injured may be classified under three headings; physical, mental, and moral. In the discussion of these qualifications, which immediately follows, their application to Army nurses, for whose instruction and guidance this section has been principally prepared, will be considered.

Physical qualification requires, health, strength, and endurance, and these can be maintained only by the faithful practice of habits in personal cleanliness, strict obedience to the laws of hygiene, avoidance of causes of indigestion, the securing of a sufficient amount of fresh air, sleep, exercise and recreation, and prompt attention to all minor ailments. Good health habits include daily bathing, frequent brushing of the teeth, keeping the hair properly cut, and clean regular habits of eating and sleeping and plenty of exercise in the open air. It is most important that the hands be kept clean and the following rules will be observed:

1. Always wash the hands before eating, and after cleaning.

2. Always wash the hands before and after caring for a patient.

3. Keep the finger nails short, well filed, and clean.

4. Keep the hands away from the face and do not pick at the face.

5. Do not allow abrasions on the hands to go unattended.

6. Keep the skin on the hands smooth, using a lotion if necessary. An infected wound on the body or any other infection should be reported at once in order that both the patient and the nurse may be protected.

To be mentally qualified requires education, judgement, the faculty of observation, a sense of order, and a good memory. Higher education, although desirable, is not absolutely essential for the success of an Army nurse, but he must have a high order of intelligence and a real desire to learn. Observation is the faculty of taking notice of things and requires constant practice for its development. A nurse must be quick to observe minute details and equally quick to act intelligently in accordance with his observations. Loss of time and many reproofs may be avoided by quick observation. A nurse possessing this quality, will notice at an operation or treatment, just what is required and often anticipate the doctors' needs.

Judgement is the faculty of being able to reach a correct decision; that is, knowing what is best to do or say under known conditions. A nurses observation and judgement should be such, that when two conditions are placed before him, he can weigh them quickly in his mind and decide as to the relative value of each.

The sense of order means; a place for everything and everything in its place, a nurse should not tolerat disorder in the things about him, nor should he allow confusion in his work.

Memory is very important in nursing; it requires constant practice of concentrating one's attention on the thing on hand, and of forming mental association which will assist in recalling things to be remembered.

Moral qualifications required by nurses, include; truthfulness, obedience, dignity, tact, courtesy, sympathy, and economy.

Truthfulness in the case of the sick takes on a broad meaning and embraces honesty of purpose, frank acknowledgement of an error, prompt confession of anything left undone, absolute accuracy of statements, and the conscientious performance of minute details.

Obedience does not mean merely obeying rules, and regulations, but includes prompt unquestioning, and intelligent obedience to authority, regardless of whether the person in authority is an officer or other superior, or a fellow nurse.

Dignity, if genuine, admits of no rudeness or familiarity from others, and at the same time is free from any display of personal importance or superiority.

Tact is the ability to deal with others without giving offense; in other words it is doing or saying the right thing at the right time.

Courtesy is defined as a well bred consideration for others, founded upon kindness, and is a very necessary qualification when the sick are irritable, fault finding, or unjust in criticism. It must always be remembered that a sick person is like a child and often is not responsible for his words and actions.

Sympathy is the feeling corresponding to that which the other person feels, and may be expressed by a smile or an encouraging word, but must not interfere with the carrying out of orders.

Economy is essential; extravagant habits may be easily acquired where there are large quantities of supplies, and this must be guarded against.

Chapter II
SYMPTOMS, TEMPERATURE, RESPIRATION, AND PULSE

Symptoms:

Symptoms are signs or evidence of disease, and are of two types: subjective, those of which only the patient is aware, and objective, those which may be observed by others.

The objective symptoms may be revealed in a variety of ways from the observation of the patient's color to carrying out the most detailed laboratory examinations. Both the subjective and objective symptoms form important data which are an aid to the doctor in making the diagnosis and a guide to him in the treatment of the patient. Some of the procedures which will reveal these data and for which the nurse is responsible are:

1. Temperature, pulse and respiration.

2. Assisting with examinations.

3. Collection of specimens.

Temperature, Pulse and Respiration:

Temperature, pulse and respiration are among the most important symptoms: So valuable an index of the patient's condition, that they are known as the cardinal symptoms. Not only are they important considered separately but their relationship to each other is often significant. For this reason a clinical or graphic chart is kept of the temperature and pulse from the time of the patient's admission to his discharge; in some instances the respirations are also charted graphically, but more often these are written in figures at the bottom of the page.

Temperature:

The temperature of the body is the balance maintained between heat production and the heat elimination. Heat is generated by the process of metabolism. The largest amount of heat is produced by oxidation of food products and activities of the organs, particularly the muscles and glands. It is eliminated through the skin, lungs and excreta. The mechanism for controlling this balance and maintaining a fairly constant temperature is not definitely explained, but it is thought to be related to a heat center. A higher degree of temperature exists in the muscles and internal organs than exists in or near the surface of the body. Temperature shows slight diurnal variations due to alternate periods of rest and activity. It is usually lowest in the early morning and reaches its highest point in the late afternoon or early evening. In order, therefore, to compare the temperature from day to day, the latter should be taken at exactly the same hours every day.

Disease produces extremes of temperature because it affects the ability of the body to keep a proper balance between the heat produced and the heat eliminated. These extremes of temperature are damaging to the tissues and very exhausting to the patient.

The Clinical Thermometer:

The clinical thermometer is the instrument used for measuring the temperature of the body. It is made by enclosing mercury in a glass bulb which is connected with a graded glass tube. Heat applied to the bulb causes the mercury to expand and rise in the tube. The height to which it rises in the tube registers the temperature. The clinical thermometer is constructed in such a way that the mercury will remain at this point until it is shaken down. The Fahrenheit scale is in fairly general use, but occasionally the Centigrade scale is used. The range of the scale on the Fahrenheit thermometer is usually from 94 degrees to 110 degrees. The range on the Centigrade thermometer is usually from 34 degrees to 43 degrees.

Types of Thermometers:

1. Mouth, used for mouth and axillary temperature.

2. Rectal, used for rectal temperature. This is constructed in exactly the same way as the mouth thermometer, but has some characteristic marking, as a colored tip, for instance, to distinguish it from the mouth thermometer.

Normal Temperature:

So called normal temperature was computed by taking the temperatures of many apparently normal people and making an average of these. Even though we speak of a normal temperature we assume some variations among individuals. 98.6 degrees F. is considered normal, but many people who are in perfect health have lower or higher temperatures.

Simple classification of temperatures:

Normal temperature, 98.6 degrees F., by mouth, or 37 degrees C.
Subnormal temperature, below 98 degrees F. or 36.7 degrees C.
Elevation of temperature, above 99 degrees F. or 37.3 degrees C.
Fever, 100 degrees F. or 37.8 degrees C. or above.

Methods of Taking Temperature and Indications for These Methods:

To take the temperature we place the thermometer in some orifice if possible, or on the surface of the body, if need be, where the blood supply is generous and from which the air can at least be partially excluded.

The three places most commonly used for temperature are the mouth, rectum, and axilla. The groin is occasionally used.

By Mouth:

This is the most convenient method of taking the temperature and is fairly satisfactory for certain types of patients. It is effected by mouth breathing, low temperature of the room or atmosphere, dryness of the mouth, and by hot or cold drinks recently taken. It is not a safe method to use for children, mental patients or irresponsible patients of any type. The normal temperature by mouth is considered by most authorities to be 98.6 degrees F., but it may vary from 98 degrees F. to 98.8 degrees F.

Procedure:

Shake the mercury in the thermometer down to about 94 degrees F., wipe off the thermometer, place it under tongue. Ask the patient to close the lips and caution him not to bite the thermometer. Leave it from three to five minutes, remove it, read it carefully and record the temperature. Place the thermometer in a glass to be washed.

By Rectum:

This is the most accurate method of taking the temperature because it is least affected by external conditions. It is used for young children, mental patients, very ill patients, or irresponsible patients of any type. It is also used when it is desirable to have a very accurate record for purpose of study or research. This method cannot be used after rectal or perineal operation or when there is a diseased condition of the rectum. The normal rectal temperature is 99.6 degrees F., but it may vary from 99 degrees F. to 99.8 degrees F.

Procedure:

Use a rectal thermometer, shake the mercury in the thermometer down to about 94 degrees F., wipe off the thermometer, lubricate the bulb with vaseline and insert it about two inches. The thermometer must always be held in place for an irresponsible patient of any type. Leave the thermometer in from three to five minutes, read it and record the temperature. Place the thermometer in a glass to be washed.

By Axilla:

This is a surface temperature and is the least accurate method. It is only used when the other methods cannot be employed. The normal temperature by axilla is 97.6 degrees F. but it may vary from 97 degrees F. to 97.8 degrees F.

Procedure:

Use a mouth thermometer and prepare it in the same way. Wipe the axilla free of perspiration, place the thermometer well up in the axilla and hold it in place. Leave it at least five minutes.

Verify with a second thermometer any temperatures which show a marked variation from the last recorded temperature.

Wash all thermometers and both dishes with soapy water and place fresh gauze in the dishes.

Caution: Do not use hot water on the thermometers. The least harm this will do is to run the mercury up so that it will be difficult to shake it down, but water at a temperature hotter than 110 degrees F. will break the thermometers. Leave the thermometers in the deep dish covered with bichloride of mercury 1:1000.

Rectal Temperature:

With the use of the technique described here it is necessary to provide separate trays for rectal and mouth thermometers. The trays can be distinguished from each other by marking them M. and R. The tray for rectal temperatures is stacked in the same way as the one for mouth temperatures with the addition of a small jar of vaseline for lubricating the thermometers.

Procedure:

The tray is used in the same way except that the thermometers are lubricated with vaseline, and gauze must be provided for preliminary cleaning of each thermometer as it is used.

Axillary Temperature:

The mouth thermometer is used. There is no difference in the use of the tray.

Private Ward:

Articles necessary. These may be kept on the patient's bureau or in some other convenient place in the room.

1. The thermometer is in a special glass with a small piece of absorbent cotton in the bottom, the glass filled with water. When thermometer is used for only one patient, it is not necessary to keep in a disinfectant. It is not safe to leave harmful drugs in a patient's room.

2. Gauze squares for drying the thermometer.

Procedure:

1. Take the temperature, pulse and respirations and record in the temperature book. Wipe the thermometer off with gauze before and after use. Leave the thermometer in the glass of water.

2. Wash both the thermometer and the glass with soap and water once a day and supply fresh cotton, water and gauze.

3. When the patient is discharged, wash the thermometer with soap and water and soak it for one-half hour in bichloride of mercury 1:1000. This disinfects the thermometer and prepares it for the next new patient.

Pulse:

Pulse is the wave exerted by the expansion of the arteries following the contraction of the heart. The muscular contraction of the heart is called systole; the period of relaxation is called the diastole. Pulse is one of the quickest and most convenient methods of getting valuable information about the patient's condition.

Method of Taking the Pulse:

1. The patient must always be at rest, either seated or lying down.

2. Pulse may be taken at any part of the body where an artery passes superficially, particularly over a bony surface. The radial artery is the one most frequently used, for it passes over the radius on the inner or thumb side of the wrist. It is very accessible and here the pulse can be easily felt. The hand and arm should always be supported and relaxed. If, for any reason, the wrist is not available, the pulse may be taken over the temporal carotid, dorsalis pedis or femoral artery. It may also be taken over the abdominal aorta.

3. Make light pressure over the artery with the first two or three fingers. Do not use the thumb because there is a slight pulsation in the thumb which might be mistaken for the patient's pulse. When the pulse is felt, observe the second hand on the watch, count the beats for thirty seconds and multiply by two. If there is the slightest doubt about the accuracy of this result, verify it by a second count.

Characteristics to Observe:

1. Rate the number of beats per minute. Rate is affected by age, sex, exercise, excitement, shock, vitality and disease.

Normal range:

Males, 60-76 per minute.
Females, 72-92 per minute.
Children, 98-130 per minute. This varies a great deal with the age. The younger the child, the more rapid the pulse.

2. Rhythm, the regularity with which the pulse wave recurs. The pulse may be regular, irregular or intermittent.

3. Volume, the size of the blood stream which is pushed on with each beat of the heart.

4. Tension, the strain or pressure of the full pulse on the walls of the artery. The pulse wave may be compressible or noncompressible.

Terms used to describe the pulse:

1. Rapid pulse, 100 or more per minute.

2. Running pulse, very rapid with beats not distinctly separated.

3. Thready pulse, a running pulse of very low tension.

4. Dicrotic pulse, both the expansion and relaxation of the artery are felt.

Respiration:

Respiration consists of an inspiration, or breathing air into the lungs, and an expiration, or exhaling air from the lungs. This is the process whereby the oxygen which is essential for burning food products is taken into the lungs and carbon dioxide, the waste product, is given off.

Method of Taking Respiration:

1. Have the patient at rest and try to count the respirations without the patient's knowledge, if possible.

2. Watch the rise and fall of the chest or abdomen, count the respirations for thirty seconds and multiply this number by two. This can be rectified by repeating the count if the respirations seem normal.

Characteristics of Respirations:

1. Rate, normal range: Adults, 16-24 per minute; children, 24-44 per minute according to age.

2. Apnea - temporary absence of breathing.

3. Dyspnea - difficult, labored breathing.

4. Orthopnea - difficult breathing relieved by the upright position.

5. Hyperpnea - excessively rapid breathing.

6. Cheyne-Stokes respirations, periodic type of rhythmic breathing.

7. Stertorous breathing - snoring type.

8. Sighing respirations.

9. Shallow respirations.

The Time and Technique of Taking Temperature, Pulse and Respiration:

Respiration:

Temperature, pulse and respiration are taken at stated times during the day. For the majority of patients they are taken every four hours. Very sick patients, especially if they have an elevation of temperature, will probably have the temperature taken every two hours, occasionally every hour, and the pulse and respiration much more frequently. Twice a day is sufficient for a few patients or in a few instances once a day for mental patients.

The technique of carrying out the procedure will depend to some extent upon the equipment provided and whether the ward is public or private. Private rooms have much more room for individual equipment and so the thermometer is usually kept in the patient's room.

Public Ward:

On the public wards either we must provide individual thermometers or we must have a method of thoroughly cleaning the thermometers so that they will not offend the sensibilities and so that there will be absolutely no danger of transferring disease from one patient to another. The latter method is usually more practicable. The following technique has been found to meet these requirements satisfactorily.

Mouth Temperatures: Articles Necessary:

1. A specially constructed tray with a glass dish in each end. The dishes should be distinguished from each other in some way. The use of a glass butter dish and cover has been found satisfactory. These are inexpensive and can be distinguished as the deep dish and the shallow one. Each dish should have folded gauze in the bottom to protect the thermometers. In the small space between the two dishes place some clean gauze squares and a small paper bag opened for soiled gauze.

2. As many thermometers as there are patients on the ward and an extra one or two for verification of any temperatures which show a marked change.

3. The temperature book in which are written the names of all patients on the ward, and the hours at which their temperatures are to be taken.

Procedure:

1. Have all thermometers on a double thickness of gauze in the deep glass dish, well covered with bichloride of mercury 1:1000.

2. Empty the bichloride of mercury from the deep dish, rinse the thermometers in cold water, dry each one with clean gauze, shake down the mercury and place them on the clean folded gauze in the shallow dish.

3. Take the tray and the temperature book into the ward and distribute six thermometers. Begin with the first patient to whom you gave a thermometer. Count the pulse and respirations, read the thermometer and place it in the deep dish, then record the temperature, pulse and respirations in the temperature book. Continue this until all six thermometers are collected.

4. Distribute six more thermometers from the clean shallow dish and continue this process until all temperatures have been taken.

Blood Pressure:

The tension of the pulse is dependent upon the blood pressure, and this in turn is dependent upon the strength of the heart beat, the elasticity of the artery wall, the degree of resistance offered to the flow of blood through the arteries, the amount of blood in the vessels and, in some degree, upon the viscosity of the blood. When the tension of the pulse is high, the artery remains distended between beats and is compressed with difficulty; sometimes it cannot be compressed even following distention, and may feel like a hard cord beneath the finger. When the tension of the pulse is low the artery does not remain distended for even the normal time of expansion, but falls quickly, is easily compressed, and the artery feels empty. To determine the tension of the pulse, the pressure required to obliterate the pressure or pulse beat is noted. This is done with the use of a blood pressure apparatus called a sphygmomanometer.

The sphygmomanometer is an instrument made especially for the purpose of accurately estimating the blood pressure. In determining the blood pressure, the arm is encircled with a rubber bag which can be inflated with air, and air is forced into this bag by means of a bulb which is connected with a dial

or a graduated tube of mercury that registers the air pressure in the bag. When this pressure occludes the artery, the pulse cannot be detected with a stethoscope distal to the bag. The pressure is then reduced until the pulse can be heard and the reading on the dial or tube will be the systolic pressure. If the air is further reduced until the sound ceases to be heard, the reading at that point will be the diastolic pressure. The pulse pressure is the difference between the diastolic and the systolic pressures and normally is about 40 m.m.

Chapter III
OBSERVATION OF THE PATIENT'S SYMPTOMS

Symptoms are signs, evidences, or indications of conditions existing, imminent, or likely to follow, and noting them is an important part of the work of a trained nurse. Too much stress cannot be laid upon the development of keen observation on the part of the hospital corpsman who is doing actual nursing. Factors essential to its development and growth to a valuable and important degree are: Alertness, intelligence, thoughtfulness, good eyesight and hearing, acute sense of smell, sensitiveness of touch, sympathetic understanding (responsiveness), sense of responsibility to patient, quick perception, sense of order, eagerness to help, practical ability to recognize when knowledge gained in classroom or elsewhere is applicable in the daily routine, knowledge of normal conditions and the effects of disease and injury, and the power and desire to learn everything possible from contact with associates and from daily experience. Constant practice of watching, listening, and reasoning, that nothing may escape notice nor its significance be lost, is an asset of great value to the patient, the doctor, and the attendant.

Symptoms are known as objective, those noted by an observer, and as subjective, those complained of by the patient, such as dizziness; faintness, weakness, and exhaustion; nausea (sensation of); pain, pecular, indefinite, hard to describe or locate; itching, with no evidence of irritation; hunger and thirst, normal or abnormal; any peculiar feelings or sensations; fear, apprehension, chilliness, hot or cold flashes; exaggerated sensitiveness to noise, light, heat or cold; shortness of breath, and thirst for air with excessive thirst for water.

Objective symptoms are readily observed by those trained to note them and consist largely of the general appearance of the patient as seen by the observer. In considering the general appearance of the patient the observer notes the gait in walking; the movements of the hands, as even or restless and jerky; the position of the body, as lying at ease, restless or tense; the attitude toward others; and the type of conversation. The facial expression may be serene; placid or drawn, pale, pinched, anxious, worried, or apprehensive (evidence of pain, discomfort, or fear, or of some emotion or mental strain). The color may be pale, flushed, or bluish. The eyes may be bright, dull, normal in appearance, staring or bulging, bloodshot, the lids red or pale, the pupils of normal dilation, contracted to pin points, or extremely dilated.

In observing a patient for symptoms there are many things to which the nurse should pay special attention. The appearance of the body should be noted, whether it is thin or well-nourished, normal or distended and swollen. The skin may be dry or moist, warm, cool or cold, firm, flabby, dry or damp and clammy, hot or feverish, without blemish or bruised and discolored. Swellings may be hard and tense, or soft and fluctuating. Distension of the abdomen may be from gas, abnormal collection of fluid, or from the accumulation of urine in the bladder or faeces in the intestine. Joints may be normal in appearance or deformed. The temperature of the body may be normal, slightly above or below normal, or extremely high or low. Respirations may be regular, even and normal in type, and frequency, or irregular, labored and painful, abnormally fast or slow, full and deep or shallow. The pulse may be

normal in frequency, force and rhythm, or abnormally fast or slow; firm, strong and elastic, regular as to force and frequency, or soft, running, rapid, intermittent, difficult to find or to count. Observation of the general appearance should include insect bites, evidence or presence of vermin or body lice and nits, and eruptions and their type. The appearance of excreta (faeces, urine,) vomitus, discharges, etc., should be observed. Pain is classified as to type: Dull or sharp; stationary or radiating; steady or intermittent; colicky; excruciating or merely irritating; superficial or deep; burning or stinging; relieved or aggravated by pressure; occurring before, during, or after eating; duration, severity, location, and extent of area involved; and whether nauseating or not. Digestive symptoms include the appetite--normal desire for food, above or below normal, capricious or stable, craving for any special foods or drink. Symptoms after eating include comfort or distress from gas, free expulsion of gas by rectum or by belching from mouth, pain or nausea.

Symptoms of abnormal conditions associated with the eyes, ears, nose, mouth, and throat may be visible to the observer or may be complained of by the patient and not visible to the observer. Any pain or tenderness in or, especially, behind the ear may indicate a serious condition (mastoiditis) which requires prompt attention. Discharges from the eyes must be reported immediately as they may be of a virulent character and endanger the sight. Deposits or patches on the inside of the throat should be promptly reported and smears or cultures taken. The general condition of the mouth and teeth should be carefully noted, and any sores, ulcers, redness, or swellings reported. Any coating of the tongue should be described and peculiar spots noted, either on the tongue or on the sides of the cheeks. Report the presence of any discharges from the throat or nares (nose).

A patient's mental condition may be described as calm, placid or nervous, excitable, irritable or hysterical, quiet or talkative, sane or delirious. He may be cheerful or depressed and melancholy; irrational, mildly or extremely so; unconscious either from delirium, shock, stupor, or coma.

A patient may assume a position in which the body is relaxed or rigid; the legs and arms relaxed or flexed loosely; stretched or drawn up taut and rigid; the legs may be flexed on the abdomen, or the head may be drawn back and the body bowed. The patient may be more comfortable on one side than on the other, or may be more comfortable in a sitting position. He may experience ease or difficulty in turning; his head may be drawn to one side; there may be loss of motion in a limb, or twitching and jerking of limbs or muscles.

Sleep may be described as quiet or restless, sound or light, normal or stupor-like, aroused from easily or with difficulty; and as to amount and time of sleep.

Coughs are classified as dry or loose; persistent, slight, strangling as from tickling in throat; hard, deep, hacking; chronic or of occasional occurrence; racking and with pain, followed by exhaustion; of a type with or without expectoration. The expectoration may be thick and purulent, or thin, very fluid, or frothy; colored light or dark; streaked with blood (bright red or rusty brown, possibly tuberculous or pneumonic); may be easily raised and expectorated, or raised and expectorated with difficulty.

Vomiting is described as of the following types: Projectile or without force; difficult, after gagging and intense nausea, or as involuntary and with ease. The amount of vomitus is described as of large, small, or medium quantity (approximate amount stated in cc.) The character of the vomitus is described as consisting of undigested, partly, or fully digested food; as containing little or no food; as clear and watery, or colored with bile; as streaked with blood, either bright red or dark in color; as containing mucus, pus, or faeces; and as with or without pain. The odor of vomitus is classified as of normal acid odor, excessively acid, bitter odor, or as having the odor of urine or of faeces (denoting serious kidney condition or bowel obstruction.) The frequency of vomiting is described as periodic, as occurring at longer or shorter intervals, and as continuing for longer or shorter periods. The time of occurrence is described as before or after eating, or between meals, and as occurring during the night or in the day time.

The voice is described as being clear or hoarse; firm and full, or thin and weak; and as loss of voice. Speech is classified as intelligible or thick and mumbling, as from shock or alcoholism, and as speech which halts with spaces between, as from weakness or loss of memory.

Perspiration is described as to amount, copious or scanty; as to odor, normal or rancid, having the odor of urine, or of some drug or food; as to duration of period of perspiring; time of perspiring, continuous or periodic, occurring during the night or the day; and whether coming on suddenly or gradually. Perspiration may be induced by sudden shock or nervous reaction, by an acute septic condition, or by some chronic or long standing condition causing weakness and debility; it may be the result of tuberculosis (as an example, night sweats, a common symptom). Perspiration may be accompanied by a sudden drop or a gradual fall in temperature; or followed by a gradual or sudden rise in temperature.

In describing hiccoughs the time of occurrence should be noted; the severity of the attack; whether it is checked easily or with difficulty; and the duration of the attack.

Eruptions of the skin should be described as to the location of the first appearance, the time of the first appearance, the progress and extent of its spread, extent of area covered; as to the character of eruption and the symptoms associated with its appearance and spread, such as rise and fall in temperature and general condition of the patient.

Numerous symptoms are associated with heart action and heart conditions. Palpitation is the rapid, tumultuous beating of the heart which is felt by the patient, sometimes seen by the observer in the heart region of the chest, at the temporal arteries, and in the carotid arteries visible in the sides of the neck. It may be caused by organic disease of the heart; is often the result of shock, nervousness, or fright; and it may be caused by overexertion. It is sometimes the result of hysteria, and may be the result of indigestion and pressure from gas in the stomach or intestine. A sudden, sharp, excruciating pain in the heart region is a cardinal symptom of angina pectoris. This is a serious condition and should be reported at once to the medical officer. In cases of this nature the attendant should remain with the patient and send someone as messenger for the doctor; while awaiting the arrival of the doctor, a hotwater bottle should be applied at once to the

area of pain. An amyl nitrite pearl should be available so that if ordered it may be broken in gauze or a handkerchief, which should then be held under the patient's nose. Difficult breathing, with distress of different types in the heart region, may be due to irritation of the muscles or membranes of the chest walls and area surrounding the heart, to organic disease of the heart itself, to acute indigestion, or some condition causing gas in the stomach or intestine with resulting pressure upon the diaphragm.

The odor of the breath may be of diagnostic value. Certain odors are often characteristic of certain diseases or conditions. When the breath has any strong noticeable odor, as sweet, urinous, metallic, especially foul or fetid, a record of it should be made, and the medical officer promptly informed. Such a report may aid in establishing a diagnosis and prescribing treatment.

Urine is one of the most important secretions of the body and when examined after excretion may present many important symptoms of pathological conditions. (See chapter on Anatomy and Physiology for description of urine.) The presence of blood, pus, mucus, and sediment of various types should always be noted. Failure of the kidneys to secrete urine is termed suppression of urine and is a distinctly organic condition. It is sometimes caused by injury to the kidneys or adjacent parts, is a symptom of a very grave condition, and requires prompt attention. Retention of urine is the failure of the bladder to eliminate the urine stored there and is evidenced by the following symptoms: A feeling of fullness in the bladder, visible distention over the bladder, pain in the region of the bladder, headache, a keen desire to void with inability to do so, and sometimes dribbling of urine. The causes of retention of urine are restriction of the bladder muscles from nervousness, a kink in the neck of the bladder from tipping when overfull, mechanical obstruction of some kind, temporary loss of power of the sphincter muscles, temporary paralysis following injury, or from other cause, and sometimes because the quantity of urine in the bladder is insufficient to stimulate it to void.

To overcome retention and induce urination give the patient a warm urinal or a urinal containing a small quantity of warm water, run water nearby where the patient can hear it; when permissible, give copious drinks of water; if permitted, place a hot-water bottle over the bladder; if patient is able, raise him somewhat on pillows and leave him alone with the urinal (consciousness of being observed, watched, or waited for, often causes a nervous reaction which in itself makes it difficult for a patient to void). Sometimes turning the patient well over on his side, or, when permitted by the medical officer, setting him up on the side of the bed with his legs hanging over will enable him to void. (The last-mentioned methods never must be used without permission of a medical officer. Should all these methods fail to induce urination, report to the medical officer, who will, if necessary, order the patient to be catheterized. Never catheterize a patient without an order from the medical officer.

Any unusual specimen of urine should be saved for observation of the medical officer who should be shown it as soon as possible after voiding, as decomposition is very rapid. The attendant should be so well informed concerning his patient that he will never fail to discover promptly any suppression or retention of urine.

Many facts concerning a patient's condition can be learned from observation of the faeces. The number of defaecations in the 24 hours should be noted. Failure of the bowel to eliminate causes absorption of poisonous waste matter and in time results in sluggish peristalsis of the intestine. A patient is often uncomfortable from a feeling of fullness in the bowel or from an accumulation of gas in the intestinal tract.

Many times headache, and sometimes nausea, is caused by inactivity of the bowel. Alteration of the size or shape of faecal matter may indicate stricture of the bowel or an obstruction of the intestine. Hard stools indicate that the faeces have been impacted for sometime and that the moisture from the intestinal content together with toxic matter has been absorbed by the system. Hard stools may also indicate that too small amounts of liquids have been taken by the patient or that some food or drug, which has a tendency to retard peristalsis or dry up secretions, has been taken. Liquid stools indicate the presence of an irritation causing increased peristalsis and increased secretions of intestinal fluid. Constipation frequently follows. The color of stools varies according to food and medicine taken and to the amount of bile poured into the intestine from the gall bladder; normaly it is brown or greenish brown. Gray or gray-colored stools are an important symptom indicating a lessening of the secretion of the liver or of some obstruction to its discharge. (Morphine addicts often have pale gray stools). If the stools are dark and tarry it is an indication that blood has remained in the intestine sufficiently long to be partly digested; it may be from a haemorrhage high up in the intestine or in the stomach which has become well mixed through the stool. Bright red blood in the stool indicates recent haemorrhage from the lower bowel where there is no digestion. Bright red blood on the surface of the stool indicates bleeding near the rectum, such as occurs from a rectal fistula, haemorrhoids, or possibly from a crack, or fissure of the external anus. The presence of pus in the stool is a grave symptom, denoting usually either inflammation of the intestine, liver, or pancreas, with suppuration, or the rupture of an abscess into the intestinal tract. The presence of mucus in a stool is the result of inflammation or irritation of the mucous membrane causing an increase in the secretion of mucus. The following parasites are sometimes found in stools: Thread worm, round worm, and amoeba (found by means of the microscope); tapeworm, hookworm, (enters through sole of foot). When these intestinal parasites are found precautions as for infectious cases should be taken to prevent their transmission to other patients or to other persons in the ward, and also reinfection of the original patient. All articles used by the patient should be kept for his sole use and disinfected as necessary.

Chapter IV
BEDMAKING

The bed when neatly and correctly made, is a most important factor in the comfort of a patient. It must be clean, comfortable, and fitted to the needs of the patient, and should have a good mattress; and good pillows. Its appearance, furnishings, accessories, and agreement with other furniture are of secondary importance.

A hospital bed is usually higher and narrower than the average one found in ahome, and this fact contributes greatly to the efficacy of the care and treatment of a patient, as it makes it easier for the attendant to care for the patient.

The mattress should always be protected by a linen or cotton mattress cover made to fit the mattress as closely as possible in order to prevent surface soiling. This cover may be laundered easily and should be changed frequently. From time to time the mattress should be turned, always from end to end, which changes the points of pressure; when turned from side to side this is not accomplished. Two pillows should be allotted to each bed, one hard, one soft. The hard pillow is placed under the soft pillow to aid in support and elevation. In cases of high fever, the soft pillow is removed as the hair pillow is cooler, allows better circulation about the head and shoulders, is non-absorbent and is less easily impregnated with odors. When necessary the pillow should be covered with a rubber sheet besides the pillow slip.

The mattress and lower sheet of all beds for strictly bed patients are protected by a rubber draw sheet which should extend several inches from the bottom of the pillow to several inches below the patient's knees and should be long enough to tuck under the mattress about eight inches on each side. As rubber should never be allowed to come in direct contact with the patient, the rubber draw sheet is covered with a cotton drawsheet which should extend about two inches above and below the rubber sheet. In the absence of a cotton draw sheet, a regular bed sheet, folded in half, lengthwise, will do very nicely.

Bed linen should be changed as often as necessary but economy in its use should be practiced and badly stained linen should never be used. The under and draw sheets should be drawn tight to prevent the formation of wrinkles under the patient which makes possible the development of bedsores. There should be sufficient covering to keep the patient warm and, while it is necessary to have the bedclothes look neat and tight, care should be taken to avoid the causing of pressure sores on the toes.

Beds and bedding should be kept free from vermin and if signs of bedbugs appear, the bed should be cleaned with a disinfectant solution, the bedding sterilized, and the mattress thoroughly brushed with kerosene and put in the sunlight for forty-eight hours.

The proper method of making a bed is to obtain all the necessary bedding, put it in a place convenient to the bed, remove all clothing which may be on the bed, and turn the mattress from top to bottom. The mattress cover should be placed over the mattress from head to foot and the tapes tied at the foot of the mattress. The bottom sheet should be placed on the bed with the wide

hem even with the foot of the mattress, tucked in at the top, and then the corners mitered in envelope fashion and the sides tucked in, taking care that there are no wrinkles. Then the top sheet is put on with the wide hem even with the head of the mattress, and the bottom tucked in, corners mitered and the sides left hanging. Next the blanket is placed on the bed in such a manner that it hangs equally at the sides, and is about eight inches from the head of the bed. Next the cover, which is often another sheet, is placed on the bed in the same way as the top sheet, folding the eight inches overlapping the blanket underneath the blanket, then the top sheet is folded over the blanket and cover at the head of the bed. Pillow cases and covers are placed on the pillows, arranged in such a manner that the corners are well-filled, the seams to the back, and placed so the closed end will be towards the entrance to the ward.

In changing the sheets with the patient in bed, we use one clean sheet a day unless soiled sheets make it necessary to use more. Our clean sheet and pillow case are placed on the bedside table and the patient's chair moved to the foot of the bed for the linen we take off the bed to be placed upon. The bed cover, which is almost always a sheet, is taken off the bed, folded and placed on the chair. This sheet will go directly over the patient later. The sheet directly over the patient will be pulled out from under the blanket from the head towards the foot, folded and placed on the chair. This sheet will replace the bottom sheet. This leaves the patient covered only with the blanket. The pillows are removed and the patient made to turn on his side. The bottom sheet is then pulled out on one side and folded or rolled close against the patient's back. The sheet which will replace it is then placed on the bed and tucked in at half of the top, the corner mitered and the side tucked in, with the remaining half rolled or folded up against the old sheet. The patient is then turned over onto the fresh sheet and we can go around to the other side of the bed, pull the old sheet out, and tuck the other half of the fresh sheet under the mattress in the usual manner. The sheet that goes over the patient is placed over the blanket and the blanket pulled out from under the sheet from the top towards the bottom. This sheet is tucked in, in the usual manner, with the corners mitered. The blanket is put back on, and the cover, all in the usual manner as described before, taking care when tucking in at the bottom to leave enough play in the sheets and blanket so as not to cause pressure sores on the toes and feet. The pillow slip is changed and the pillows replaced under the patient's head.

In making an ordinary post-operative bed we always use a draw sheet and, unless otherwise ordered, remove the pillows and replace them with a bath towel. The sheets and blankets that cover the patient are not tucked in until the patient has been placed in bed, but are folded back neatly. The hanging edges of the side of the bed that the patient is put in will be folded neatly up onto the bed and three or four dry hot water bottles placed between the covers to insure a warm bed for the patient when he returns from the operating room. These are removed just before the patient is placed into bed. The blanket covering the patient when he returns is left on him for three or four hours. After the patient has been placed in bed we can tuck in the sheets and blanket at the bottom and miter our corners.

The ether bed is made the same as a post-operative bed except that a blanket goes directly under the patient. This blanket goes directly over the draw sheet. The reason for this is that patients under an ether anesthetic perspire profusely and this perspiration can be absorbed by the blankets the patients lie between.

When making an oxygen bed we first place a rubber sheet over the mattress cover. This sheet should cover the entire mattress to prevent any leakage of oxygen into the mattress. The rest of the bed is made in the usual manner, with a rubber draw sheet and draw sheet, and we always keep another sheet at the bedside to go over the foot of the oxygen tent.

Chapter V
NURSING

The administration of therapeutic treatments is concerned with the use of agents other than medicines to produce therapeutic effects. The use of such agents is largely external and in their application there is required considerable skill, manual dexterity, and physical ability on the part of those giving such treatments.

When therapeutic treatments are applied externally their action naturally takes place through the skin and the effects produced may be local or remote. The application of heat and cold to the body in the treatment of disease constitutes one of the most important procedures in general nursing practice, and has for its principal objectives: 1. A change in blood distribution and the amount of blood present in any area or areas; and 2. A local or general change in body temperature. When heat is applied to the body the circulation is quickened, the skin becomes flushed and warm as its blood vessels are dilated, perspiration is increased, the temperature is raised, and the blood supply to the head and internal tissues is decreased. When cold is applied to the body the circulation is slowed, the skin becomes pale and cool as its blood vessels are constricted, perspiration is decreased, the temperature is lowered, and the blood supply to the head and internal tissues is increased; later, when reaction occurs from the effects of cold, the blood supply to the head and internal tissues becomes normal and the other conditions mentioned change to the opposite.

Hot packs and hot baths are given principally to induce perspiration and to relieve muscular tension.

The articles necessary for giving hot packs are: An ice cap, four blankets, one towel, a foot tub lined with a rubber sheet in which to carry blankets wrung out of very hot water, five hot-water bags, pitchers of hot and cool water, a glass and drinking tube, and a large rubber sheet.

Soak two blankets in water at 150° F., leaving one corner of the upper and lower edge of each blanket out of the water (these corners should be diagonally opposite each other, as the blanket will then, when stretched, be somewhat on the bias); wring each blanket separately (two attendants are required, each taking a dry corner and twisting in opposite directions until the blanket has been wrung dry.) It then should be placed in the foot tub lined with a rubber sheet covering hot-water bags, and the process repeated with the second blanket; carry the blankets to the bedside while the rubber sheet is still folded over them; pass two dry blankets with rubber sheet between under the patient; remove the pajama suit; wrap the patient in the dry blanket upon which he is lying; and turn the upper bedclothes over the foot of the bed. Place one hot blanket under the patient and one over him; fold the rubber sheet over the wet blankets; pull up the bedclothes, placing a towel around the patient's neck; apply an ice cap to the head and hot-water bags to the hips, arms, and feet. Watch the patient's pulse and encourage him to drink freely , unless directed to the contrary. The usual duration of this pack is 20 minutes.

During and after removing a hot pack take the pulse at the temporal artery frequently; give plenty of fluids while the patient is in the pack;

watch for collapse, in which case discontinue the pack and apply external heat; remove the wet blankets under cover of a dry one, thus avoiding exposure; wrap the patient in a dry blanket and leave an ice cap applied to the head and a hot-water bag to feet. Draw up the bedclothes and let the patient remain between blankets for one hour, at the expiration of which time dry the patient and give him an alcohol rub.

Two commonly-used methods for applying heat are the foot and sitz baths.

Foot baths are used for the relief of congestion either in the feet or in some other part of the body, as the throat, abdomen, or chest. Sometimes mustard is added in the proportion of two tablespoonfuls to the gallon of water.

To give a foot bath in bed the articles required are a foot tub full of water at 108° to 112° F., a large blanket, a small towel, and a pitcher containing water at 130° F.

Loosen the upper bedcovers at the foot of the bed and double them back to expose the feet and legs to the knees; gently lift the legs and arrange a rubber sheet, covered with a bath towel, on the bed under the feet; place the foot tub on the bed alongside of the feet and place a folded hand towel over the edge of the foot tub upon which the legs will rest when in the tub. Next put the arm nearest the foot of the bed across the tub and place the other arm, the hand of which supports the heels, under the patient's legs; raise the feet from the bed and at the same time draw the tub into position; place the patient's feet gradually into the tub, lowering and lifting them into and out of the water several times until he becomes accustomed to the temperature, keeping the free arm across the tub during this procedure. A folded blanket then may be wrapped around the tub and the bedclothes drawn down. The feet usually are left in the water for 20 or 30 minutes, and the water maintained at the required temperature by adding water from the pitcher. During this process place the hand between the stream of water and the patient's feet to guard against injury. In removing the feet put one arm and hand under the patient's legs and heels; lift the feet from the tub; hold them above it for a few seconds in order that the excess water may drain off; place them on a bath towel; remove the tub from the bed; and dry the feet and legs thoroughly. Gently remove the rubber sheet and towel and replace the bedcovers.

In the sitz bath the thighs and trunk up to the waistline only are immersed; the temperature of the water is 110° to 112° F.; and the duration is from 5 to 10 minutes. It is used principally for the relief of local inflammation in the pelvic region.

Cold is applied principally for the purpose of: 1. Stimulation of the vital processes, circulation, respiration, etc.; 2. Relief of congestion; 3. Stimulation or quieting of the nervous system; and 4. Reduction of temperature.

The primary effect of cold is the contraction of the superficial blood vessels and drives the blood from the surface to the interior of the body.

The following rules should be observed in the administration of cold

baths: A cold compress or ice cap should be applied to the head to prevent an increased flow of blood to that part of the body; a hot-water bag should be placed at the feet, as this tends to prevent chill or rigor, conditions which are evidence of muscular contraction and a too decided difference between the temperature of the central and the peripheral portions of the body, Continuous light friction is given for the same reason. Stimulants should be administered 15 or 20 minutes before the bath to prevent chilling and to help counteract any undesirable effect from immersion; hot drinks should be given after the bath, and blankets should be left on until reaction takes place.

Baths to reduce high temperature usually are given every three or four hours while the temperature is 103° F. or over. The temperatures of cold baths vary from 65° to 95° F., and the duration also varies (10 to 20 minutes being the average). The temperature, pulse, and respiration always should be taken one hour after the bath and charted with dotted line to indicate the drop or rise.

When giving a cold pack protect the bed with a rubber sheet; wrap a wet sheet around the patient in such manner that no two surfaces of skin come together; apply a binder to the limbs; keep the sheet wet by squeezing water of the required temperature over it; rub the surface of the sheet briskly; apply an ice cap to the patient's head a hot-water bag to his feet. The duration of the pack should be 15 minutes.

In giving a cold pack when the patient is not to be turned, the following apparatus and materials are essential: A large basin or foot tub containing water at the temperature prescribed (usually 60° to 70° F.); three bath towels; several cotton or linen towels, the number depending upon their size (usually seven or eight); a bath thermometer; a basin containing a few small pieces of ice; an ice cap or compress; a hot-water bag; and a binder for the loins.

Remove all top covers except the sheet; pass the binder around the pelvis; protect the bed by placing a bath towel on either side of the patient and one over the legs; wring the towels fairly dry and place them around the arms and legs and over the chest and abdomen; remove the top sheet; have an extra towel in the water with which to start changing those on the body, and change them in turn at the rate of one every minute, rubbing the towels covering the body between changes. Dry the body by rubbing with a dry towel; cover with a blanket, apply a hot-water bag to the feet; draw up the bedclothes and administer a hot drink of either broth or beef tea.

In giving either a hot or cold pack be careful that no two skin surfaces are permitted to come together; watch for collapse during the process; protect the bed; avoid pressure upon the abdomen; avoid too much turning of a very ill patient; heat should be applied after a bath; screen the bed; prevent drafts; have the room warm before giving the bath.

When the giving of a cold pack, a cold bath, or a cold sponge is inadvisable, an alcohol sponge is often employed to obtain the desired results. Less solution is used in giving an alcohol sponge, for alcohol evaporates more rapidly than water, thus giving greater stimulation to the nerve endings, and causing more rapid cooling of the skin. An alcohol sponge is

given when it is unwise or impossible to move the patient too much; when quick results with less danger of violent reaction are desired; when the shock of the ordinary cold-water sponge would be too great; and when for any other reason other baths are contraindicated. One quart of 50 per cent alcohol is necessary.

Before starting to sponge take and record the patient's temperature, pulse, and respiration, noting particularly the character of the pulse and respiration. Then bring equipment to the bedside; replace the top covers with a bath blanket and fold the covers to the foot of the bed. Remove the patient's pajamas, place an ice-cap on his head and a hot-water bottle at his feet. Place a rubber sheet covered with a bath towel under each arm, slipping them well under the shoulder and axilla, down along the side of the trunk and well under the hips. Similar protection should be placed under the legs and thighs. Spread the patient's legs well apart, place his arms away from his sides and arrange a loin cloth or towel over the pubic region. Give the patient a quick, light friction rub over the body. The alcohol solution should be kept at the desired temperature by adding small lumps of ice as necessary and in it should be placed 6 compresses. Compresses, well wrung out, should be placed over the abdomen and, rolled or folded, in each axilla, and should be changed every 3 minutes. Fold the bath blanket to the foot of the bed using a bath towel for any necessary protection of the body; exposure of the body to the air assists in the radiation of heat, the evaporation of moisture, and the consequent cooling of the body surface. With long, light strokes sponge the nearest arm and leg, allowing three minutes for each; next sponge the chest, then the opposite arm and leg. If permissible to turn the patient sponge his back, buttocks, and along the back of his legs, using long, smooth strokes; otherwise raise one side and then the other enough to allow sponging underneath as far as possible to reach. In the same manner raise each leg and sponge the under surface as freely as possible. Apply friction if patient shivers, and watch constantly for unfavorable reaction, frequently feeling the pulse. Dry, if necessary, with light strokes of the towel. Draw up bath blanket (or sheet) and remove compresses and loin cloth. Finish procedure and make patient comfortable according to routine for other baths. Take temperature one-half hour to one hour following the sponge, and keep constant watch of pulse and respiration during and for some time following the sponging.

For some conditions medicated baths may be ordered, the temperature of the bath, the quantity of the medicament and the length of time the bath is to be taken also being specified.

For medicated baths the trunk and extremities should be covered by the bath water which requires the tub to be between half and three-quarters full; an ordinary-sized bathtub when half full contains about 25 gallons of water.

In medicated baths the patient lies quietly in the bath for 10 to 20 minutes and then is removed and enveloped in a warm sheet and dried gently by patting over the sheet. These baths are given largely for their soothing effect upon the irritated skin; rubbing will counteract the benefit of the bath and should not be practiced.

Of the medicated baths the bran, starch, bicarbonate of soda, and sulfur baths are used in the treatment of skin diseases, and mustard, Nauheim,

and salt baths are used to produce counterirritation, improve the cutaneous circulation, and thereby relieve congestion of the viscera and for other abnormal conditions.

For the bran bath 1½ pounds of bran contained in a thin cloth bag is boiled in a basin for 20 minutes. the fluid drained off and added to the bath water, which should be at a temperature of about 95°.

The bicarbonate of soda or alkaline bath is generally used to allay itching of the skin. It is prepared by dissolving in the bath 8 ounces of bicarbonate of soda to each gallon of water used. When tested with red litmus paper it should give a strongly alkaline reaction. If the water has a slippery feeling it is sufficiently alkaline.

In the starch bath one-half pound of starch is first mixed with sufficient cold water to cover it and enough boiling water is slowly added so as to make a paste of about the consistency of thick cream, which is then poured into the bath water and thoroughly mixed with the hands.

For the sulfur bath ½ to 2 ounces of sulfurated potash to each 15 gallons of water is dissolved in a small quantity of hot water and added to the bath water, which should be at a temperature between 85° and 95° F.

Substances which produce more or less local vascular excitement when applied to the skin are termed irritants and when these or other substances are employed to excite a reflex influence on a part remote from the place of application they are termed counterirritants. In the application of counterirritants the sensory nerve endings lying beneath the surface are irritated and this promotes relief of congestion and inflammation in either an adjoining or a distant part.

Drugs, heat, and cold are used as counterirritants and their principal purposes are to relieve congestion and inflammation as in tonsillitis, pneumonia, and headache; to promote absorption of serous effusions, as in pleurisy, and exudates around joints; to stimulate nerve centers in collapse; and to increase peristalsis and thus overcome tympanites. Substances used as counterirritants produce different stages of irritation according to their strength and the length of time applied and are known as rubefacients or reddeners, which cause the superficial vessels to dilate and redden the skin; vesicants which produce a blister; and caustics or escharotics, which cause a burn or sloughing. Rubefacients are sometimes spoken of as first degree irritants, vesicants as second degree irritants, and escharotics as third degree irritants.

The rubefacients in general use are heat (both dry and moist), mustard pastes, flaxseed poultices, stupes, cupping, and certain liniments. Unless special care is exercised in the use of rubefacients, blisters may be caused which, unlike those resulting from vesicants, may be very slow in healing, and may become infected. Substances employed as rubefacients may be classed as physical (heat and cold), mechanical (cupping, friction, pressure, etc.), and chemical (ammonia, iodine, turpentine, ichthyol, etc.). Rubefacient counterirritation by heat usually is produced by the use of hot-water bags, hot-air baths, compresses, poultices, stupes, and by electric-pads. Such hot applications are applied for the stimulating effect (heat expands the

tissues and thus increases hyperaemia to a greater degree than any of the other counterirritants.) Moist heat induces softening of the tissues and at the temperature attained by the use of poultices, if applied directly over an inflamed area, will favor suppuration. For this reason the use of poultices sometimes may produce harmful results. Moist heat is more penetrating than dry heat.

Hot-water bags. The water must not be hot enough to scald; the bag should be half full; superfluous air should be forced out of the bag and water appear in the neck before the cap is screwed on; an uncovered hot-water bag should never be given to a patient, and care should be taken that a blanket intervenes between the covered bag and the body of an unconscious patient. Post-operative patients require special care when hot-water bags are applied and should not be left alone while the hot-water bags are in the bed. An attendant never should take a patient's word concerning the temperature of a bag, but should judge for himself and carefully watch the skin for reaction. Be sure the hot-water bag does not leak.

The use of electric pads requires important precautions. When these appliances are used make sure that the insulating material around the wires is intact; otherwise the bedclothes may be set on fire. It should be remembered that if the pad is used continuously for any length of time its temperature will increase and it may burn the patient, the heat causing the perspiration to scald him.

Hot wet dressings should be applied in the form of fluffed gauze or rolled gauze compresses wrung out of a hot antiseptic or sterile solution. They should be applied and covered with thin oiled silk or rubber sheeting to protect the bedclothes and mattress, and a hot-water bag should be placed outside of the rubber sheeting to maintain the heat. Precautions should be taken against permitting a wet dressing to become cold, especially at night; carelessness may result in the development of serious complications.

Poultices are hot, soft, moist pastes prepared for local, external application. Flaxseed meal is the substance generally used for poultices because when cooked or par-boiled it retains heat and moisture for a considerable time. The following articles should be at hand: Flaxseed meal, saucepan with boiling water, oiled muslin of sufficient size to cover the poultice when flushed, old muslin cut 2 inches larger than the required size of the poultice hot-water bottle, 2 dressing towels, tablespoon, spatula, soda bicarbonate, a binder, and a light wrap of flannel for shoulder or chest covering. When the water (one-half pint for medium-sized poultice) is boiling, gradually add the flaxseed, stirring constantly with the tablespoon to keep the mixture smooth and without lumps. When of the right consistency the paste may be easily scraped from the sides of the pan. At this time add a small amount of soda bicarbonate and with the tablespoon beat the poultice until it becomes fluffy; then put it on the muslin and with the spatula spread it quickly to within 2 inches of the edges. Turn the edges back over the paste and cover with one layer of muslin, the edges of which are folded under the foundation of the poultice. Fold the poultice in a warm towel or a folded newspaper, carry it on a hot-water bag to the bedside, and after testing its temperature against the cheek apply it to the patient who has been previously prepared. The patient's skin should be oiled and the poultice applied in the same manner as a stupe, except that after making sure that the poultice is not too hot the binder is adjusted and left in place

for 30 to 45 minutes, or as ordered, when another poultice is applied. On removing a poultice put it in a waste receptacle; never use it a second time. After removal of a poultice the skin surface should be dried, observed as to the degree of redness, and covered with a layer of warmed cotton which should remain until the next poultice is applied or its removal is directed. After use the equipment should be cleaned and placed in order. Always put water in a cooking pan as soon as the paste has been taken out.

Stupes, or hot fomentations, are prepared by placing two layers of flannel in boiling water, wringing as dry as possible by means of a canvas or towel and applying directly to the skin, which has been greased with petrolatum to prevent blistering. The flannels are covered with a light rubber sheeting or heavier flannel and kept in place with a bandage or binder, and are changed frequently. They usually are allowed to remain over a period of from 20 minutes to 1 hour, or as directed. If the stupes are ordered over a broken surface, sterile gauze should be used and wrung dry by means of a sterile towel, observing the strictest asepsis in regard to water, hands, material, etc.

In preparing stupes for application to the abdomen the following equipment should be at the bedside: Electric stove and basin of boiling water, piece of oiled muslin and three pieces of flannel or old blanket; binder, chest protector, and three towels; vaseline or oil, stupe wringer, and waste receptacle; safety pins; and, if turpentine stupe is to be given, a medicine glass, mixing rod, turpentine, and olive oil. Have basins and electric plate near, but at a safe distance from the patient. Fold one piece of flannel double and, placing it in stupe wringer, immerse it in the boiling water, leaving the ends of wringer out of the water. Protect the patient with a chest protector or lightweight blanket over his chest, turn the bedcovers down, and cover the abdomen with a warm, dry flannel and oiled muslin. Protect the bedclothes with towels at upper edge and beyond the area of application. Remove the flannel from the boiling water, wring it as dry as possible, and give the folds a quick shake to somewhat cool the stupe. Before applying, test the temperature of the flannel by laying against the cheek, then raising the abdominal cover slightly, slip the folded stupe under it, and over the abdomen. After applying the stupe raise it slightly and lower it a few times if the patient complains or if the skin becomes too red. Prepare another stupe in like manner and replace the first when it cools. Repeat applications for the length of time prescribed or until the purpose is accomplished. On completion of the treatment cover the abdomen with a warm, dry flannel and secure the binder, which has been previously placed in position. Remove equipment and make it ready for further treatment.

When turpentine stupes are to be given it is desirable to mix the turpentine with olive, cotton-seed, or mineral oil in the proportion of 1 part of turpentine to 2 of oil for an adult and stir well so that there is no danger of globules of turpentine remaining free. After heating apply the mixture to the abdomen with the tips of the fingers which prevents leaving a stray drop remaining to burn the patient when the heat is applied. Then apply the heated flannel as previously described, making 2 or 3 applications of the turpentine and oil during the procedure, if desired, ascertaining each time that they are warm and well mixed.

Mustard sinapisms, or plasters, are used in the form of a mustard paste or mustard leaf. The paste is made from flour and warm water, into which

mustard is stirred in the proportion desired, usually varying from one-eighth to one-half, the latter proportion for applications to the chest. If the skin is sensitive the white of an egg should be mixed with the mustard. Spread the paste on thick muslin, turn in the edges, and cover the surface next to the skin with gauze. This application generally is allowed to remain not longer than 15 minutes, and should be watched carefully. Certain individuals blister more rapidly than others. After removing, if the skin is very red, a bland ointment should be applied. If the official mustard leaf is used, it should be dipped in tepid water, allowed to drip, applied directly to the skin or on a layer of thin muslin, allowed to remain for 5 or 10 minutes, and watched carefully to avoid blistering. After removal the surface should be dried and kept covered until all redness has disappeared.

If the plaster is made some distance away from the patient it should be placed on a hot-water bottle to be carried to the patient's bedside. The action of a mustard plaster is due to the presence of an irritant volatile oil which is released when mustard is combined with water.

Iodine is applied as a counterirritant by "painting" the area to be treated with a solution of the desired strength and allowing it to dry. Blistering is to be avoided by making certain; That the solution used is of the proper strength; that the patient is not idiosyncratic to iodine (some skins cannot bear a single application of iodine without being burned); that dressings are not applied over surfaces to which iodine has been applied; and that iodine is not applied in conjunction with bichloride of mercury. A second application of iodine should not be made too soon nor continued applications made on consecutive days over too long a period.

Cupping is the application of glass cups in which a vacuum can be created to parts of the body surface to obtain hyperaemia and to relieve congestion in underlying parts. The vacuum is created by heat or by suction. In creating vacuum by heat great care must be taken to avoid heating the rim. A cupping glass should never be forcibly removed, but by gentle insertion of the finger tip under the edge of the glass the vacuum can be destroyed and the cup then removed easily.

Cold usually is applied as a counterirritant in the form of ice, iced water, and iced solutions by the use of ice caps, ice coils, compresses, local baths or irrigations.

In using ice caps the ice should be broken into pieces about the size of a walnut, using a canvas bag and mallet. After half filling the bag the air should be expelled by squeezing and the cap securely screwed down. The bag should not be more than three-quarters full and always should be covered with gauze. After use the surface of the bag should be washed with a disinfectant and hung up to dry before putting away.

Cold compresses consist of several layers of gauze or absorbent cotton immersed in cold water or iced water, wrung out to remove the excess water, and applied to the desired part. These compresses must be changed very frequently in order to keep the part cold. Eye and throat compresses are the most commonly used cold compresses. Absorbent cotton should be used for the eye compresses, the pad consisting of several layers of cotton a

little larger than the eye in size but not large enough to extend over the bridge of the nose. If both eyes are to be treated, separate pads and separate basins of iced water should be used for each eye. When there is discharge from the eye the same compress must never be used more than once. A receptacle should be provided, in which to throw the soiled compresses. A compress should not be allowed to remain on a part until it becomes warm.

Chapter VI
NURSING

Among the therapeutic treatments that rank high in importance and which require more than ordinary skill in their administration are the enemata.

An enema, or clyster, is the injection of fluid into the lower bowel by way of the rectum for therapeutic or nutritive purposes, and is usually classed as evacuant or retention.

The general object of this form of treatment is to relieve constipation by cleansing the lower bowel; to soothe, nourish, or stimulate; to destroy micro-organisms or worms; to act as an astringent; to relieve distension from gas; to supply tissues with needed fluid, to supply medication locally, or to the general system; and to increase or decrease body temperature.

The following routine equipment is required for giving an evacuant enema: A bath blanket or sheet, an extra rubber sheet and covering; irrigator standard; irrigating can, fully equipped with tubing, connecting tubes, tip and rectal tube, stopcock or regulator, all connected ready for use; pitcher of solution, properly prepared and of required temperature; bedpan and cover, lubricant and wooden tongue depressor; kidney basin, bath thermometer; gauze compresses; mixing spoon; basin with warm water for cleansing patient following enema; towel; bed screen. The following points should be remembered: Have all necessary articles assembled at the bedside; have patient properly screened; never expose patient; have mattress well protected with extra rubber sheet and a sheet.

The simple soap-suds enema is the one most frequently given, and for this there should be kept on hand a jar of liquid soap, prepared by boiling or dissolving some pure soap in sufficient water to form a soft jelly. To prepare the enema dissolve two or three ounces of this jelly in a pitcher of water at temperature of 108° F., mix well, and remove froth. If pieces of soap are used, after water becomes sufficiently soapy remove pieces to prevent clogging of the tubing. Carry solution, covered, to the bedside, where proper assembly of articles and preparation of bed and patient have been previously made.

When giving an enema replace the upper bedclothes with a blanket or sheet; draw the patient to the right side of the bed, turn him on his left side, drawing up and flexing somewhat the right leg, and drawing the left leg down and back somewhat; have the right amount of solution at right temperature; lubricate the tube well to make insertion easy, and to prevent injury; expel all air from tube by allowing the solution to flow through until of the right temperature; pinch the tube and insert it in the rectum. Use no force when introducing the tube or tip. If the sphincter muscles are tense, encourage and assist the patient to relax by reassuring him and explaining the necessity of so doing; remove pressure on the tube and allow the solution to enter slowly; if the patient complains of pain, and gas is heard rolling shut the clamp on the tube for a moment and move it slightly back and

forth, at all times urging patient to relax and prevent premature expulsion of the enema. Frequently where gas has accumulated behind the faeces some will escape about the tube or, forcing back the fluid in the tube, escape through it in bubbles in the top of the can; following this relief from escape of gas, more fluid may be injected until a pint or more has been given. Urge the patient to retain this for 15 or 20 minutes, or as long as he can without distress, when it should be freely and voluntarily expelled. Occasionally a patient, because of weakness, constriction of muscles, or from temporary paralysis of peristalsis, is unable to expel the enema. When this occurs hot stupes are sometimes used to stimulate muscles and relax rigidity, and if these are not effective the fluid is siphoned off by inserting the rectal tube and draining the fluid into the bedpan. When this is necessary the object of the enema has been accomplished only partially, for peristalsis has not been stimulated and the abdominal muscles have not been relaxed as they should have been. The resulting relief is much less; in fact, this is sometimes a dangerous symptom, as, when following an operation, it may indicate peritonitis; or in typhoid it may indicate a perforation of the intestine. Sometimes when too small a quantity has been taken or when the system, needing fluids, has absorbed much of the enema, a second enema will have to be given. When this is necessary use the routine procedure, but watch carefully for any ontoward symptoms. Stop immediately and siphon off fluid, if excessive discomfort, distension, or other unpleasant symptoms occur. When the enema has been expelled remove the bedpan, cover it and take it from the ward immediately. Thoroughly cleanse the patient, remove the extra rubber and draw sheets, replace pajamas, straighten and tidy the draw sheet, and replace the bath blanket or sheet with the bed covers, leaving the patient comfortable and clean. Remove all utensils and return them to their accustomed places in readiness for the next time needed. Air the room thoroughly, and make a complete and correct record of results of the enema on the bedside notes. The rectal tube or tip should never be placed in the enema can, but removed from tubing and placed in a receptacle for that purpose.

Retention enemata are given for the purposes of: 1. Supplying a patient with food or fluid when he is unconscious, unable to swallow, cannot retain food or fluids taken by mouth, or his body is dehydrated; 2. Administering medicines; 3. Administering local applications to the mucosa of the rectum and lower bowel; and 4. Administering anaesthetics. Barium sulfate is sometimes introduced into the lower bowel in this way so that X-ray photographs of this part of the intestine may be taken.

The amount of fluid given in retention enemata varies, 6 to 8 ounces being the usual maximum amount when given within a short period, but may be considerably more if given drop by drop over an extended period of time. The temperature of the fluid should ordinarily be 100° F. Retention enemata should be given strictly according to specific directions as to quantity, rate of speed, and length of time to be retained. Before giving ascertain that the lower bowel has been emptied sufficiently long to allow peristalsis to have subsided. For small amounts of fluids a rubber catheter with funnel attachment may be used. Following the introduction of the fluid a hot compress applied with pressure to the anus for a few minutes will often assist greatly in preventing expulsion of the enema. Remove the catheter slowly, pinching the tube or applying the shut

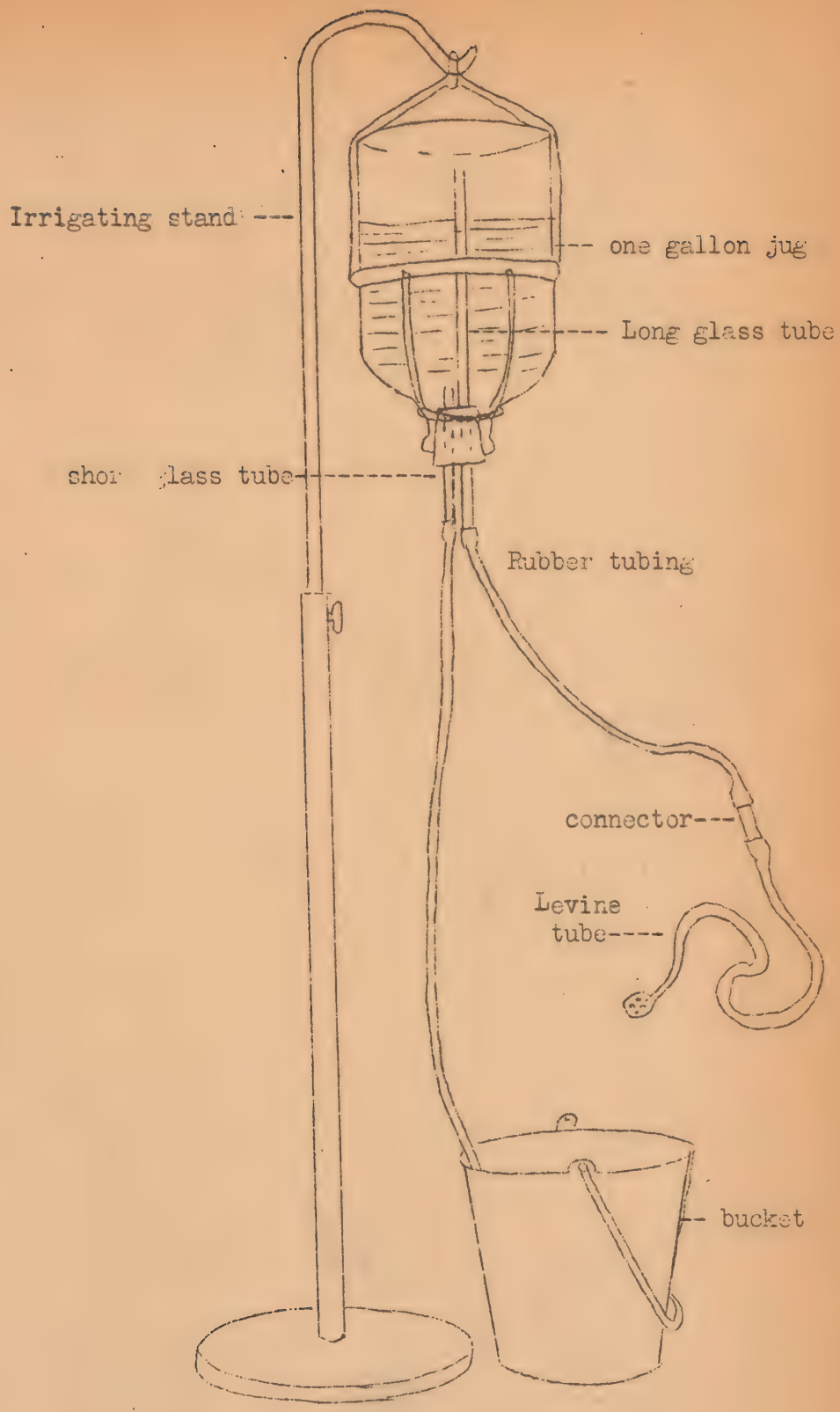
off before and during the removal of the tube. Nutritive enemata consist of specially prepared foods in liquid form. They are prepared according to various formulae, depending upon the conditions for which given, and the preference of the medical officer prescribing. Sedative enemata usually contain some drug or special preparation for quieting or soothing and are given according to specific directions. The patient should be made as comfortable as possible before the sedative enema is given so that he may be ready for sleep following it. Astringent enemata consist of hot water (120° F.) or of some astringent preparation for drying up or lessening intestinal secretions or for stopping haemorrhage. They are given under definite instructions from the medical officer. Carminative enemata are occasionally used. These are of many types but two are of sufficient importance to be mentioned here. These are the turpentine enema and the milk and molasses enema. These cause an increased expulsion of flatus. Turpentine enemata are made by mixing 1 dram (1 teaspoonful) of turpentine with 1 ounce of cotton seed or mineral oil. This mixture is then added to 1 pint of soap suds and is stirred constantly while it is being given. Milk and molasses enemata are made up of equal parts of milk and molasses (usually 7 ounces of each). This mixture should be retained by the patient as long as possible and then followed by a soap suds enema.

Enteroclysis, also termed colonic flushing or rectal irrigation, is the introduction of a large amount of fluid into the colon by way of the rectum, provision being made at the same time for a return flow of all fluid not absorbed. The object of enteroclysis is to cleanse the colon and rectum of toxic, irritating, or putrefying material, and to remove mucus. The equipment required consists of a two-way rectal tube of rubber or a satisfactory substitute; a rubber operating pad (commonly called a Kelly pad); a rubber sheet or newspaper to protect the deck; a bucket to receive the outflow; sufficient solution with convenient means of adding it as needed to the contents of the irrigating can; and the remainder of the equipment the same as listed under routine equipment for enemata. A cleansing enema is given before starting enteroclysis to free the colon and rectum of faeces; following this the inflow and outflow go on simultaneously; the introduction of two tubes, instead of a two-way tube, is accomplished by inserting the inflow tube for 3 inches, then inserting the outflow tube just inside the rectum, then gently pushing both tubes 3 inches farther in. All tubes inserted in the rectum should be well lubricated.

All routine precautions for enemata are essential in giving enteroclysis and in addition care should be taken to provide adequate means for the disposal of the unusual quantity of solution; the return-flow tube should remain in until the outflow ceases; the contents of the can should be replenished as often as necessary until the required amount has been given or the purpose accomplished, and at no time should the can become empty and air enter the tube. The result should be noted and recorded accurately so that the medical officer may be fully informed as to the effectiveness of the treatment.

Instead of the soap-suds enema for cleansing, some medical officers prefer to use either physiological salt solution or a 2 per cent sodium bicarbonate solution for this purpose as it is less irritating.

Two important therapeutic treatments frequently given are gastric lavage and gavage.

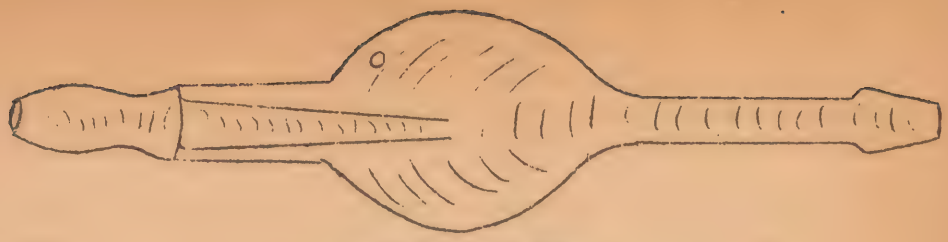


WANGENSTEEN DRAINAGE SETUP

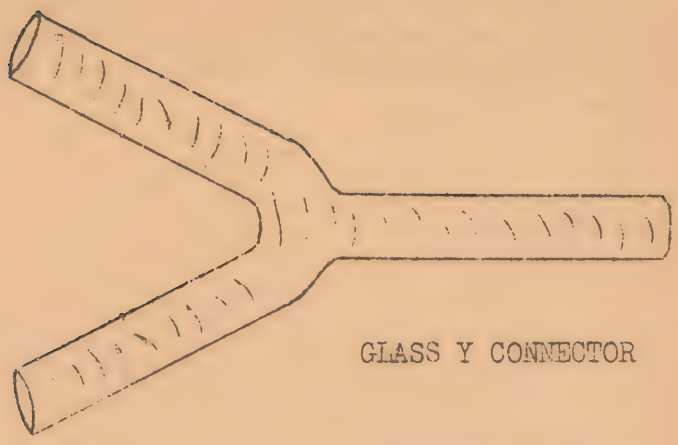
Gastric lavage is the washing out of the stomach. Its object is to remove poisons, to remove irritating substances or those causing nausea, vomiting, or distension, and to relieve congestion. It should be remembered that except in cases of poisoning, a lavage must never be given without an order. When giving a lavage reassure the patient, instruct him to remove any false teeth, to breathe naturally through the mouth and nose, to hold the head slightly forward and lowered, and, as the tube is introduced, to contract the throat as in swallowing. Never force the tube, but take sufficient time, working quietly and encouraging the patient, and if the patient complains of severe pain when fluid is introduced, or blood appears, stop treatment immediately and report to the medical officer. Never allow the funnel to become empty during the introduction of the fluid; do not tickle the back of the patient's throat when introducing the tube. Insert the tube only to the mark (16 to 18 inches), as this indicates the limit the tube should be inserted. See that clothing is loose about the neck.

The necessary equipment consists of a lavage tube coiled in ice, a pitcher of the prescribed solution at a temperature of 105° F., a kidney basin; gauze handkerchief; 2 rubber aprons; white enamel bucket; towel; mouth gag or tongue depressor; rubber sheet, or a newspaper to protect the deck; and a lubricant, such as glycerin or liquid petrolatum. The solution used is usually 3 to 5 per cent soda bicarbonate, 2 per cent boric acid, or plain water. When ready to introduce the tube place the patient, if he is conscious and able, in a sitting position, explain the procedure and reassure him. Thoroughly wash the hands and take a position to the right of the patient, give him a gauze handkerchief and a kidney basin, and protect him with a rubber apron or sheet covered at the neck with a towel.

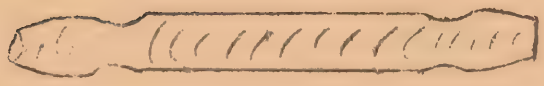
A bucket should be convenient for the return flow. Take the tube from the ice and expel all air from it by stretching it, and pinching it at the funnel end, 2 or 3 inches from the end to be inserted. Hold the tube so curved that it will not strike the back of throat as it is inserted. Insert just above the tongue and instruct the patient to swallow just as he would swallow food. Glycerin applied to the tube makes swallowing easier. Pass the tube steadily but without force until the mark on the tube reaches the lips. Try to make the patient fully understand that if he relaxes and breathes easily the tube will be passed without discomfort while if he is rigid or struggles, it will be passed with much more difficulty, and with far more discomfort to him. Hold the funnel about 6 inches above the patient and pour in the solution, always refilling when the funnel becomes half empty. When about a pint of fluid has been given invert the funnel quickly, while still half full, to below the level of the stomach, for siphonage, instructing the patient to lean forward at the same time. Repeat the procedure until the required amount has been given, or until the return flow is clear. Then pinch the tube and withdraw it quickly. Place the tube and funnel in the basin before releasing pressure on it to prevent release of the contents on the patient or the deck. Give the patient a mouth wash and bathe his face with cool water. Remove equipment and set it in order. Rinse the tube and funnel with clear cold water to thoroughly cleanse it from all deposits, then boil them before replacing on tray. If lavage is given in the absence of the medical officer, save the return flow for his inspection. Record the time of treatment, the amount of solution given, and the amount and appearance of return flow.



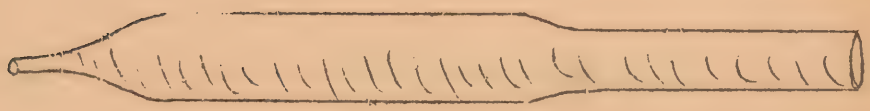
MURPHY DRIP BULB



GLASS Y CONNECTOR



GLASS CONNECTING TUBE



GLASS IRRIGATING TIP

Gavage signifies the introduction of liquid food into the stomach through a tube. It may be oral (through the mouth) or nasal (through the nose). Gavage is indicated following operations upon the mouth; in cases of insanity or excessive weakness; in tetanus; in cases of spasm or stricture of the oesophagus when the patient is unable to swallow; during continuous unconsciousness; and to administer an antidote or other medication.

The procedure for oral gavage is the same as for lavage, except that the fluid introduced is in smaller quantity and is allowed to remain in the stomach instead of being siphoned off. After introducing the tube, wait until all muscular contractions have ceased and the sensation of gagging has been overcome; then slowly pour in the food, pinching the tube before all food has left it, to prevent air entering the stomach, or food being drawn into the trachea. Withdraw the tube quickly. Have patient lie down and remain quiet until all danger of vomiting is past. Clean and replace equipment as following lavage.

Derivation of Drugs.

Drugs or medicines are derived from the animal, vegetable, and mineral kingdoms.

The active principles of drugs are those constituents which are active in producing the effects of the drug; morphine, for example, is the active principle of opium. Among active principles are alkaloids and neutral principles. Alkaloids are usually very insoluble in water, but combine with acids to form soluble salts; they have powerful medicinal effects; their Latin names end in ina and their English names in ine; morphine, atropine, and quinine are some of the alkaloids of the supply table. Neutral principles are neutral in character; they are distinguished by having their Latin names ending in inum and English names ending in in. Among neutral principles of the supply table is santonin.

Organic acids are found in organic substances. Examples: acetic acid, citric acid. Mineral acids are obtained from the mineral kingdom. Examples: sulphuric acid, hydrochloric acid. They neutralize alkalies and when concentrated act as caustics.

Alkalies or antacids neutralize acids and in some forms act as caustics. Examples: bicarbonate of soda, potassa.

Fixed oils are non-volatile, and are decomposed by boiling with water and an alkali, the resulting products being soap and glycerin. Examples: olive oil, castor oil. Volatile or essential oils exist in plants from which they are extracted by distillation with water; they evaporate when exposed to the air and have penetrating aromatic odors. Examples: oil of cloves, oil of peppermint.

Classification of Remedies.

Medicines are sometimes classified according to their most noticeable effects, thus: Alteratives are remedies whose action may be beneficial, especially in chronic diseases, by favorably altering deranged functions. Examples: arsenic, iodides.

Anodynes or analgesics are remedies which relieve pain. Examples: opium, acetphenetidin.

Anesthetics are agents which temporarily destroy sensation; they are subdivided into general anesthetics and local anesthetics. General anesthetics are volatile substances which, when inhaled, destroy consciousness and sensation. Examples: ether, chloroform. Local anesthetics act directly upon the nerves of the part with which they are brought in contact, destroying sensation temporarily. Examples: cocaine, phenol.

Anthelmintics are agents used to expel worms from the intestines. Examples: santonin, thymol.

Antidotes are remedies against poisons; thus the alkaline sulphates are antidotes for phenol.

Antipyretics are agents which reduce fever. Examples: quinine, antipyrin.

Antiperiodics are remedies which oppose the periodic return of symptoms. Examples: quinine, arsenic.

Antiseptics are substances which prevent or retard septic decomposition by destroying or arresting the development of the bacteria of sepsis. Examples: Alcohol, phenol, (Germicide and Disinfectant are almost synonymous terms and signify that the agents used are strong enough to destroy microorganisms.)

Astringents, of which alum is an example, are substances which cause a constriction of tissues and lessen discharges.

Carminatives are agents which cause the expulsion of gas from the stomach and intestines; the essential oils are carminatives.

Cathartics, purgatives, and laxatives are medicines which increase the action of the bowels. Laxatives have a mild action; example: cascara sagrada. Purgatives are more powerful; example; castor oil. Drastics have a violent action; example; croton oil. Hydragogue cathartics produce copious watery stools; example: epsom salt.

Diaphoretics are agents which increase the secretion of sweat. Dover's powder is a diaphoretic.

Disinfectants are substances which destroy the specific germs which infect people with disease. Phenol and corrosive sublimate are disinfectants.

Diuretics increase the flow of urine. Example: sweet spirit of nitre.

Emetics cause vomiting. Ipecac and apomorphine are emetics.

Expectorants are agents which promote the secretion and expulsion of mucus from the bronchi. Ammonium chloride is an expectorant.

Hypnotics produce sleep. Barbital and chloral are hypnotics.

Narcotics are agents which produce stupor. Example: opium.

Sedatives are agents which allay excitement, irritation, or pain. They may have general or local effect and include anodynes, narcotics, and anesthetics.

Styptics are substances which arrest bleeding when locally applied. Alum is a styptic.

Certain drugs affect the skin, urine, or feces in a way that should be known to those charged with their administration:

Drugs which may produce an eruption on the skin: Arsenic, acetanilid, antipyrin, belladonna, bromides, chloral, copaiba, iodides, opium, acetphenetidin, quinine, salicylic acid, turpentine.

Drugs which color the feces: Iron—black; bismuth—slate color or black; calomel—green.

Drugs which color the urine: Phenol—dark green; rhubarb—yellow; santonin—saffron color if the urine is acid, purplish-red if alkaline.

Drugs which have a tendency to become liquid on exposure to air by the absorption of moisture, are said to be deliquescent or hygroscopic, while those which lose their water of crystallization and become dry and powdery are called efflorescent.

Administration of Medicines.

Medicines are given by the mouth and stomach, by the rectum, by the skin, blood-vessels, and subcutaneous cellular tissues. By the mouth and stomach is the method ordinarily employed. Medicines which are irritating to the stomach should be given well diluted and after meals. The rectum is sometimes employed for the administration of medicines when the stomach will not retain them.

Remedies are injected into the veins direct only in case of great emergency. An exception to this rule are certain remedies used in the treatment of syphilis and normally administered intravenously. The administration of drugs by the subcutaneous cellular tissue is called the hypodermic method; it is employed when prompt action is desired. Alkaloids like morphine and strychnine are especially suitable for this method, and large quantities of normal salt solution are frequently so employed. Substances are also introduced into the circulation by simply rubbing them into the unbroken skin. Fats and oils and remedies incorporated with them are often used in this way. Syphilis is frequently treated by inunctions of mercurial ointment.

Ether and chloroform are given by inhalation. Steam may also be impregnated with certain drugs and inhaled.

Principles of Dosage.

Doses are only relative and cannot be represented in exact figures, since they are subject to so many influencing circumstances. The principal of these are age, size and weight, habit, idiosyncrasy, interval between doses, time of administration, condition of stomach or (if externally applied) of skin, disease, climate, method of administration, form of drug used, etc.

Dosage in Children.

Doses ordinarily given are those for adults; to compute the suitable quantity for a child, either of the following rules may be made use of:

(1) Young's method: Divide the age by the age + 12; thus, suppose the child is 3 years old $\frac{3}{3+12} = \frac{3}{15} = \frac{1}{5}$: hence we give one-fifth of the adult dose.

(2) Cowling's method: Divide the number of the following birthday by 24; thus, child's age is 3, next birthday is $\frac{4}{24} = \frac{1}{6}$: hence dose is one-sixth that of adult (this gives a slightly smaller dose than does Young's rule).

Children bear opium badly, and hence the dose should be proportionately small. Comparatively large doses of belladonna, aconite, mercury, arsenic, quinine, and cathartics in general are borne by children.

When given hypodermically, the dose of medicines is two-thirds of that used by mouth. When given by rectum, it is four-thirds of the dose by mouth.

Latin words and phrases used in medicine and their meanings:

A'dde,	add.—ad.
Ad li'bitum,	at pleasure.—ad lib.
Ante ci'bum,	before food, before meal,—a.c.
Ad satura'ndum,	to saturation.
Be'ne,	well.
Ana, ää,	of each.
Bis,	twice.
Bis in di'e,	twice daily,—b.i.d.
Bu'lliat,	let (it) boil.
Ci'bus,	food.
Cochlea're ma'gnum,	a tablespoon.
Cochlea're parvum,	a teaspoon.
Co'la,	strain.
Colluto'rium,	a mouth-wash.
De'in,	thereupon.
Dimi'dius,	half.
Di'vide,	divide,—div.
Do'sis,	a dose.
Et,	and.
Exte'nde,	spread.
Exte'nde su'pra,	spread upon.
Fac,	make.
Fi'at (sing.), Fi'ant (plur.),	let (it, them) be made (into) —F.
Fi'ltra,	filter.
Grada'tim,	gradually.
Gu'tta,	a drop,—Gtt.
Gutta'tim,	drop by drop.
Ho'ra,	an hour—h.
In di'es,	daily.
Lage'na,	a bottle.
Li'bra,	a pound.
Li'nteum,	lint.
Ma'cera,	macerate.
Ma'ne,	in the morning.
Ma'ne pri'mo	early in the morning.
Mica pa'nis,	a crumb of bread.

Mi'sce,	mix—M.
Non,	not.
No'cte,	at night.
No'cte mane'que,	at night and in the morning.
Nu'merus,	a number—No.
Nu'mero,	in number—No.
Octa'rius,	a pint—O.
Pa'rtes æ qua'les,	equal parts—p.e.
Post ci'bum,	after food, after meals,—p.c.
Pro re na'tâ,	as required—p.r.n.
Qua'ntum sufficiant,	as much as is necessary—q.s.
Qua'qua ho'ra,	every hour—q.h.
Re'cipe,	take—R_x.
Satura'tus,	saturated.
Sca'tula,	a box.
Se'mel,	once.
Semissis,	a half—s.s.
Semidra'chma,	a half drachm.
Si'gna,	write, mark—sig.
Si'mul,	together
Si'ne,	without.
So'lve,	dissolve—solv.
Sta'tim,	immediately.
Suffi'ciat,	may suffice.
Ta'les,	such.
Ta'les do'ses,	such doses.
Te're,	rub.
Te're si'mul,	rub together.
Ter in di'e,	three times a day—t.i.d.
Tri'tura,	triturate.

Chapter VIII

CATHETERIZATION

Catheterization is the art of drawing urine from the bladder by means of a catheter. The catheter usually used is a hollow soft rubber tube about 14 inches long, in various diameters.

It is usually best to have on the ward a sterile catheter set ready for use at all times. The catheter set consists of:

1 emesis basin
3 catheters, nos. 18, 20, 22.
1 towel, folded accordion fashion.
1 medicine glass.
1 curved Kelly forceps.
6 cherry sponges.

The above articles are placed in the emesis basin and the entire set is wrapped in a muslin wrapper and is rendered sterile by autoclaving.

We also keep on the ward a tray containing a bottle of green soap solution for washing the penis, alcohol for additional cleansing, sterile lubricant for lubricating the catheters, and also a bag of sterile sponges.

Procedure:

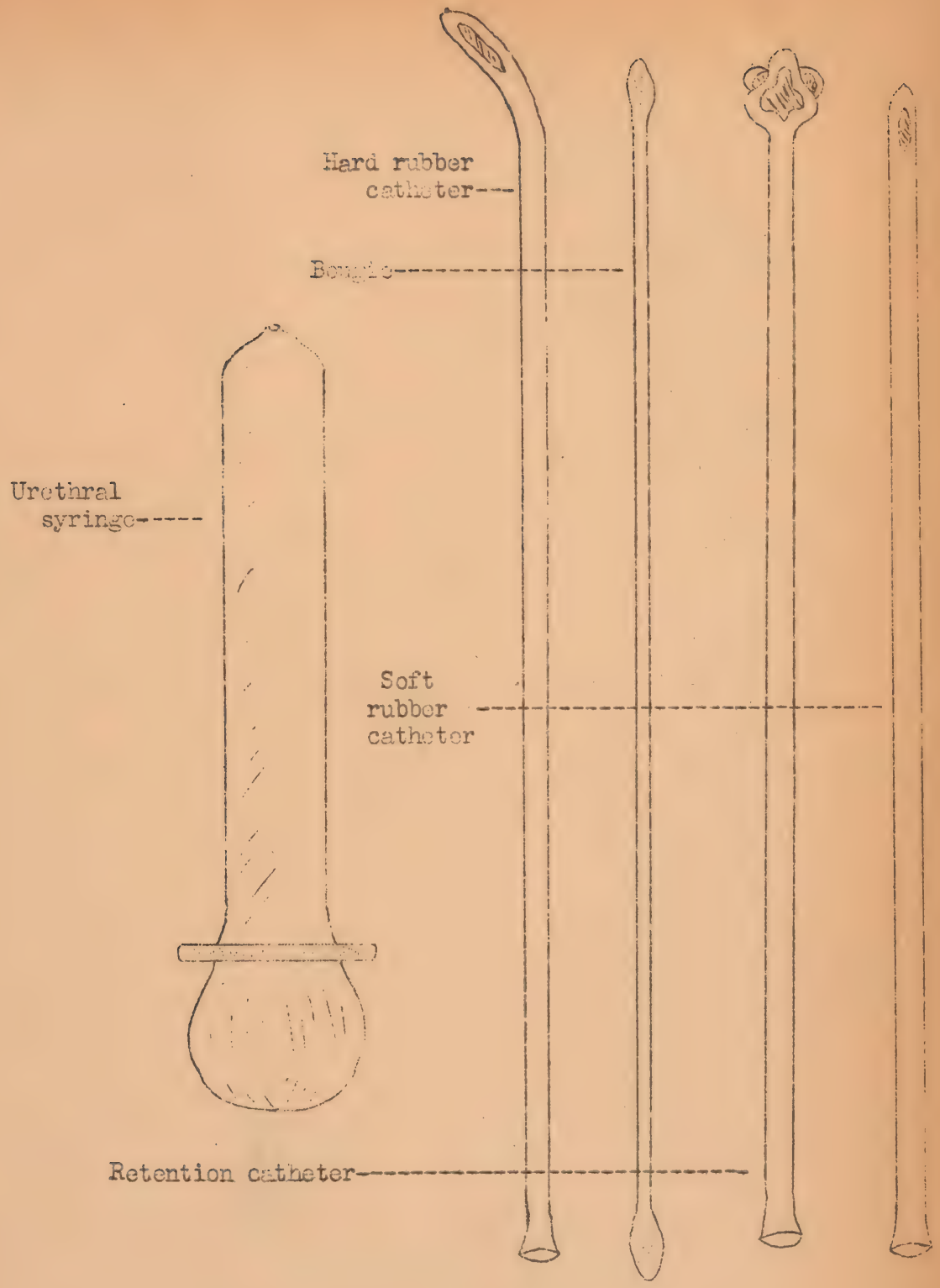
The necessary articles, including a urinal, are brought to the bedside and the patient is well screened. The bedclothes are pulled below the patient's knees. The sterile set may be opened and the towel placed across the knees just below the penis. The penis is then washed thoroughly with green soap, followed by a thorough sponging with alcohol, after which the towel may be pulled up so that the penis rests directly over it. The medicine glass is filled about halfway with the lubricant and we are ready for the actual catheterization.

The catheter is picked up with the sterile forceps about 2 inches from the tip and the other end is held between the fourth and little fingers. To insert the catheter, we dip the tip into the sterile lubricant, take the penis with our free hand and lift it to an upright position. The catheter is then inserted slowly and, at the same time, the penis lowered slowly as the neck of the bladder is reached, until the flow of urine designates it has reached the bladder, the end of the catheter running into the urinal which is placed between the patient's thighs beforehand. Should an obstruction be met with, the catheter is withdrawn slightly, and again pushed on as before. Never try to use force.

When removing the catheter, pinch the end and gently and slowly pull the catheter out and sponge off the penis.

The dangers of catheterization are injury to the urethra, due to undue force, and cystitis, or inflammation of the urethra and bladder, due to germs on an unclean catheter.

When through catheterizing, measure the amount of urine in the urinal.


Hard rubber catheter
Bougie
Urethral syringe
Soft rubber catheter
Retention catheter

This should be charted and also chart any abnormal observations in the urine.

Always boil the materials used when finished and wrap the catheterization set for autoclaving and re-use.

Chapter IX
INFUSION, INTRAVENOUS, HYPODERMIC, AND INTRAMUSCULAR

1. An infusion is the process of administering or forcing drugs, or fluids into the body by means other than the alimentary tract. When quick action is desired an infusion is given intravenously into the median basilic or the median cephalic vein at the bend of the elbow, thus the solution will flow in the direction of the heart and be distributed throughout the body very rapidly.

2. A hypodermic infusion is a much slower method and is given into the cellular tissues usually under the breasts or into the fleshy part of the thigh.

3. Intramuscular infusions are a little slower than both of the other two methods and are given into the muscular parts of the body.

4. This is done by injecting into the veins (intravenously) into the tissues under the skin, (subcutaneously, or hypodermoclysis) or into the muscles, (intramuscularly).

5. Infusion solutions.

a. Normal salt (saline) is a solution of 0.85% sodium chloride or a solution containing 8½ parts of salt to 1000 cc. of water. A solution of this strength has the same salt content as the blood, and does not destroy red blood corpuscles. It is called an isotonic solution. A weaker salt solution is called a hypotonic solution and will in most cases rupture the red corpuscles. This is called hemolysis. When a solution is more than .9% it will cause the corpuscles to shrivel up or cremate. This is a hypertonic solution and result is plasmolysis. A solution of 0.6% sodium chloride is also spoken of as a physiological salt solution. This is often used when other substances are to be added to the solution, which might tend to change the isotonic power of the fluid, (the power of maintaining the integrity of the corpuscles.)

b. The action of normal saline. When a patient has lost a large amount of blood the heart may stop beating, because the quantity of blood in the blood vessels may be insufficient for the heart to pump. The heart beats then become very weak and feeble which may ultimately result in death. In such cases normal salt solution is often injected into the veins using the infusion method in quantities from 500 to 1000 cc. or more. In cases where quick action is not necessary it is injected into the tissues or muscles. This supplies fluid for the circulation so that the heart will continue to beat and maintain the circulation of blood until new blood can be formed to replace the quantity lost.

The effect of an intravenous infusion of normal saline solution is immediate. The heart beats become vigorous, the pulse becomes stronger and more bounding and the patient feels stronger. The blood pressure is raised and life processes are generally accelerated.

In addition to its regular or principal use in shock, collapse, and haemorrhage, normal saline is also used as a medium in which to dissolve

medicinal substances that are not to be given by direct injection into the veins. Such solutions do not affect the integrity of the corpuscles.

c. Glucose. Glucose solutions have the same effect on the circulation as normal salt solutions, but they provide energy as well. If the percentage of sugar in the blood is increased, the fluid is absorbed into the blood to lower it, and if this percentage is lowered, fluid is eliminated through the kidneys to raise the percentage. It is also used to increase the flow of urine. Given intravenously in infusions, a 10 to 15% solution in about 250 to 300 cc. of normal saline is used.

d. The above solutions are made with sterile distilled water and put into flasks which are covered by a 4 x 4 piece of gauze and over the gauze is placed a wrapper about 5 inches square. These covers are held in place by a rubber band. The solutions are then labeled with tags and autoclaved. After autoclaving, date the solutions as they are not to be kept for too long a period.

e. The infusion pack. In most hospitals regular intravenous packs are put up, autoclaved, and kept ready for immediate use. These packs contain the following articles:

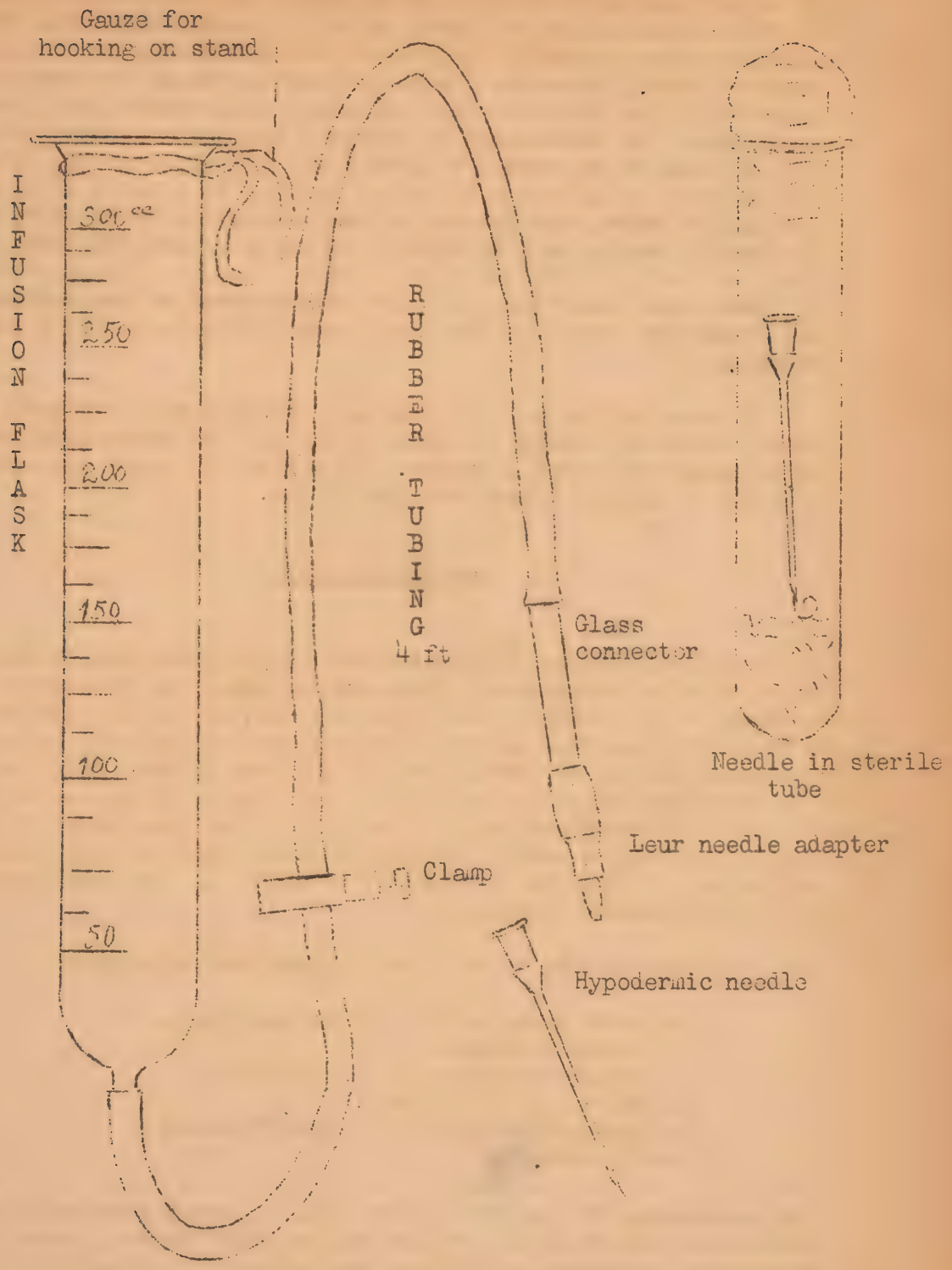
One infusion bottle.
Long rubber tubing about four feet with clip.
Short rubber tubing with small glass connecting tube and adapter for Luer needle.
Two cotton sealed tubes, each containing a needle, a large Luer needle or aspirating needle, and a smaller of the same types are used. (usually #17 and #19, 1-3/4" long.)

f. Other materials required:

One irrigating stand.
Jars of alcohol sponges. 4 x 4 dressings and adhesive tape,
Sterile kelly forceps.
Sterile sponges.
Merthiolate or iodine usually in a sterile medicine glass. In substitute of sponges and medicine glass, sterile cotton applicators may be used, and dipped into bottles containing iodine or merthiolate.
Sterile solution.

Preparing the patient for an intravenous infusion. The site is selected, the vein found and a tourniquet is placed about four inches above the vein but not tightened. The site is washed with an alcohol sponge and the area on and surrounding the vein painted with iodine or merthiolate which is allowed to dry and then washed off as much as possible with another alcohol sponge. The flask is hung on the stand and the rubber tube attached. The small tube with the adapter is connected to the tube on the flask with the glass connecting tube. The proper needle is selected and removed from the tube with the sterile kelly and placed on the adapter. Next the solution is poured into the flask, and

INTRAVENOUS INFUSION SET



a square of sterile gauze placed at the opening to prevent contamination by dirt or foreigh bodies. The pinch clip is opened to let the tube fill with the solution until a few drops emerge from the needle. This is done to prevent air from being forced into the vein. The tourniquet is then tightened and the patient told to close his fist. This will cause the vein to swell slightly, enabling the operator to insert the needle easier. When the needle is inserted properly into the vein, blood will flow into the tube and can be observed in the glass connecting tube. The tourniquet is loosened and patient told to open fist and the clip again opened to permit the solution to flow into the vein. The flow of the solution can be controlled by raising or lowering the irrigating stand, and in some cases, controlled by an adjustable clip; the needle can be kept in place by a strip of adhesive tape.

Make sure that there is a competent person at the patient's side at all times and never let the flask drain entirely before removing the needle.

In removing the needle, take an alcohol sponge and hold over point where needle is inserted. Draw needle out and press puncture firmly with sponge for about a minute. If desired, a small dry sterile dressing may be applied after removing needle.

HYPODERMOCLYSIS

As mentioned earlier in this lecture, Hypodermoclysis is the infusion of fluids into the subcutaneous skin usually under the breasts or in the fleshy parts of the thighs. The apparatus differs in this method of infusion in the following manner. Instead of using one tube direct, we use two tubes that are connected to the tubing attached to the flask. This is done by a glass Y. tube connection on the ends of each tube. A Luer needle adapter is fixed with a $2\frac{1}{2}$" needle on each. When giving the hypo under the breasts, one needle is inserted under each breast far enough to insure absorption. The needles are affixed to the skin with adhesive. The same preparations are used as in Intravenous infusions.

The following is the set-up for a hypodermoclysis pack:

Arm board covered with cotton and gauze.
1 - Infusion flask.
3 - 3 feet tubings with Y. connector.
2 - Adapters, Tube clamp.
2 - Needles in each test tube (#19 - $2\frac{1}{2}$")
3 - 4 x 4's.

The intramuscular infusion is the same as hypodermoclysis except that the needles are inserted deeply into the muscular tissues, such as the buttocks and the shoulder muscles. This is a much slower infusion than either the Intravenous or Hypodermic infusion.

Chapter X

PREOPERATIVE AND PREANESTHETIC CARE

One of the most important phases of surgical nursing is the preparation of the patient before undergoing an operation. This includes numerous details, that no matter how unimportant they may seem, must be carried out.

In preparing a patient for an operation we must consider the mental as well as the physical side. It is very common for a patient to worry and become nervous and sometimes irritable while undergoing preoperative treatment and it is the duty of the hospital attendants to put the patients mind at ease, and give him a confident attitude towards the situation. Remember that when a patient's mind is at ease, he sleeps well the night before the operation. The body relaxes and these things are a big help not only to the patient, but the surgeon and anesthetist as well.

The physical preparation varies according to the doctors, and the type of operation, but in almost any operation the three main factors are the area of the operation, the intestinal tract and the kidneys and bladder.

Both the stomach and the intestinal tract should be as nearly empty as possible if a general anesthetic is to be administered or if the operation is to be an abdominal one of any kind. Stomach contents are almost certain to be vomited early under a general anesthetic and this in addition to being an interference with smooth anesthesia may cause asphyxia through aspiration of the vomitus, and postoperative pneumonia and other pulmonary disorders may also sometimes be attributed to such an aspiration. Likewise, intestinal contents are likely to be evacuated as soon as the anesthetic has taken effect. And if these organs are not empty and collapsed in the care of an abdominal operation, they obstruct the operative field; or if involves the interior of them, escaping contents will almost certainly cause infection; and in addition, intestinal contents encourage other disorders postoperatively as will be brought out when we come to "complications" of surgery.

To the end of having the intestinal tract empty, a mild laxative may be given twenty four, or not later than twelve hours in advance of the operation, and this may be followed by a cleansing enema several hours before the operation depending on such circumstances as the patient's strength and condition otherwise, and the nature of the operation, etc., and in many cases only the enema will be given.

To insure an empty stomach, substantial food of all kinds will usually be withdrawn about six hours in advance of the operation, and even water will be held during the last three or four hours, though there will be an undernourished or otherwise enfeebled patient for whom this sometimes distressing routine may be relaxed somewhat. But in any case only light fluids such as broths will be permissible in the last few hours, milk always being excluded at this time, even in any tea or coffee which may be allowed.

When the stomach itself is to be operated on or in cases where it is not empty, as in accidental feeding after the prescribed time, in emergency cases, or in such a condition as intestinal obstruction where there is vomiting, or reversed peristalsis, a lavage will probably be given at the last moment.

The Operative Field

The aim of this treatment, of course, is so to prepare the skin (or mucous membrane) over a wide area surrounding the site of the future wound that it may eventually be rendered sterile or as nearly so as possible. Sometimes this will include the application of germicidal solutions and other times it will consist only of preliminary cleansing measures, and in any case there will be further treatment in the operating room which will be discussed when we come to the subject of operating room sterilization in general. Skin and mucous membrane are very difficult to cleanse surgically because they are complex surfaces with many irregularities of structure--their several layers, the ducts of secreting and excreting glands, hair follicles and hair, etc.--and because secretions and excretions are constantly being deposited upon them, the preparation of the operative field thus being an exacting procedure in surgical nursing which can never be done too well.

As to the method by which this part of the preparation will be done there is no standard, the reason doubtless being that no entirely satisfactory method has yet been devised, largely because of the natural difficulties mentioned. Moreover, the part of the body to be prepared, the age of the patient, the condition of a particular patient's skin, etc., would require variations from time to time within any system which might be adopted. The best that one can do with the subject, therefore, is to present some of the representative methods which may be found in use in various hospitals and communities.

Shaving. Regularly the first step in the preparation of the skin is shaving, and this is by no means a minor step. Hair is next to impossible to sterilize and any that remains upon an operative field is almost certain to retain bacteria there with it. A clean shave, therefore, is obligatory and to this end are necessary a sharp razor and the utmost thoroughness in the use of it. All areas being shaved should be traversed two or three times, and the general direction for drawing the razor should be against that in which the hair naturally inclines because otherwise long stumps of hair will remain and often the razor will glide over fine hair without cutting it at all.

The best shaving can be done when the skin, or more specifically the hair, is thoroughly softened with a thick lather of soap and water. Whether or not the lather is used, however, will depend upon the treatment the part is to receive after the shaving. That is, a solution of iodine is often used as a final sterilizing agent and this does not penetrate deeply into wet skin (and the same is true of some of the other solutions which may be used). Moreover, an abnormal amount of water in the skin appears to intensify the irritation which iodine causes in any case. Therefore, if iodine is to be applied the shaving will usually be done dry unless perhaps twelve hours or more are to intervene before the iodine application.

Cleansing of the Field. When wet shaving is permissible the opportunity will naturally be seized of following it with a thorough-going application of that greatest of all cleansers, soap-and-water. And by "thorough-going"

one understands in this case, not vigorous rubbing but prolonged (for at least two or three minutes) gentle sponging with a gauze or cotton sponge and a thin lather, keeping the entire area wet all the time, remembering that soap and water act chemically, that time is a factor in chemical action, and that vigorous rubbing, while it hastens penetration, may abrade this skin which has doubtless been scraped thin by the shaving. Thorough rinsing with water is important after the scrubbing, and if the skin is not broken and will permit it otherwise, the water should be followed by alcohol or ether, or alcohol followed by ether, or a mixture of the two, as a final eliminator of the soap and all that it has freed and carried with it. Caution should be observed, however, in all such treatment of freshly shaven skin because shaving, as we have just said, will have scraped it thin and so may have rendered it painfully sensitive to such solutions as alcohol and ether and even to vigorous rubbing with only the water. Furthermore, alcohol and ether very actively extract respectively the water and the oil from the skin so a too prolonged or a too vigorous application of these agents may cause chapping.

Sometimes nothing more will be done to the operative field after such a process as the above, or after dry shaving, except probably keeping it covered with a sterilized towel till the patient reaches the operating room. Otherwise, some such procedure as one of the following will be carried out:

A. After dry shaving the field may be painted with half-strength (3½% made with alcohol) tincture of iodine, 5% picric acid, mercurochrome, Scott's solution, etc., and a sterile dressing applied to remain till the final treatment is given in the operating room.

B. In order to have the skin well cleansed after dry shaving, and at the same time to keep it dry, benzine may be used as the cleansing agent, the benzine then being scrubbed off with ether, after which the half-strength iodine may be applied, or merely a dry sterile dressing may follow the ether. This method is especially useful in emergency cases because the need for cleansing is often great there, and benzine is a good substitute for soap and water in any case.

C. After the wet shaving and the cleansing process the field may be sponged with some such solution as 1-500 bichloride of mercury or Harringtons' fluid. The perineum, for example, to which very few of the germicidal solutions are applicable, may be treated thus with the bichloride. And of course, a sterile dressing will be kept in place after such treatments.

D. For the hands and feet, which are exceptionally difficult to cleanse because of the nails and the clefts between the fingers and toes, and for bone and joint surgery which requires the most exacting precautions against infection, especially painstaking preparation will be required. Prolonged scrubbing (for perhaps ten minutes) with soap and water by means of a gauze sponge or a brush may be used on these parts, and after thorough rinsing with water an aqueous paste of chlorinated lime and carbonate of soda (washing soda), using two parts of soda to one part of lime, is sometimes rubbed into the crevices around the nails for the purpose of softening and thus more thoroughly cleansing them. At the same time, of course, the nails are given a thorough "manicure." This combination of lime and soda is a very

good germicide, and if it is applied thoroughly for two or three minutes the parts should be considered so nearly sterile that sterile water should be used for the rinsing. Alcohol may then follow the sterile water as a further rinser and as a drying agent and then, of course, the parts will be kept thus clean with a sterile dressing.

Mucous Membrane. As a preparation for the mouth there can be little more than a very painstaking brushing of the teeth and sponging of the tongue, and perhaps an irrigation with normal salt solution or some good standard cleansing mouth wash, though when the teeth are infected or in poor condition generally the services of a dentist may be sought before important operations are undertaken within this cavity which can never be rendered completely sterile.

For Rectal (or Colonic) Anesthesia.

When the anesthetic is to be administered rectally, as avertin will be always and ether sometimes, special attention will be directed toward emptying the colon, so there will almost certainly be an enema, or possibly a series of enemas till the return is clear, the night before operation, and there may be another enema three or four hours in advance of the injection of the anesthetic. Since the success of anesthesia of this type is exceptionally dependent upon mental composure and physical relaxation upon the part of the patient sedatives will be given plentifully--perhaps a mild one the night before in the interest of a good night's sleep, morphine (usually with atropine) an hour or so before the anesthetic, and as a local sedative a chloretone suppository is usually administered thirty minutes or an hour before the anesthetic is injected. And naturally, when so many medicinal sedatives are called into service all possible nursing measures for quietness and relaxation will be employed to make the drugs effective.

For Regional Anesthesia.

When the anesthetic is to be one of the "local" variety a field in addition to the operative one may have to be prepared because the injection may be made about nerves at some distance from the operative field which they supply--the nerve block type of regional anesthesia. There are many possible sites for this special "anesthetic field," depending upon the several varieties of nerve block anesthesia. For example, for an abdominal or pelvic operation or one upon the lower extremities there may be spinal anesthesia (called also subarachnoid block) for which the anesthetic will be injected into the spinal canal in the lumbar region. Then, there may be paravertebral block for which the injection will be made about nerves at points, near their exits from the spinal column, thus requiring a preparation of some region of the back for possibly an appendicectomy or some other abdominal operation as well as for kidney cases and others. Again, the sacral region may have to be prepared for the several methods of anesthetic injection about nerve trunks there (caudal block, trans-sacral block, sacral block) for operations upon the bladder, vagina, rectum, etc. And for operations upon the arm, axilla, or shoulder there may be the brachial plexus block in which the field to be prepared for the anesthetic will be at the base of the neck in the region of the clavicle (opposite the brachial plexus).

And there will be various other fields thus apart from the operative field from time to time.

Then, there is the field block type of regional anesthesia but it will require no special preparation beyond being sure that a wide area is cleansed because the anesthetic will be injected about the immediate border of the operative field.

In regional anesthesia a sedative, probably morphine, and in spinal anesthesia perhaps also scopolamine, will usually be given half an hour or more before the operation.

False Teeth and Jewelry.

All such removable articles are carefully laid away till the patient has recovered from the anesthetic. In addition to being subject to loss they may be damaged during anesthesia, and false teeth may be accidentally swallowed or they may lodge in the throat and cause respiratory complications. Occasionally there will be objection to the removal of a finger ring which should then be anchored to the wrist with a piece of tape or bandage.

Temperature, Pulse and Respiration.

Records of these signs are always made immediately before the patient is taken to the operating room.

The Bladder.

At the last moment before the operation the bladder must be emptied, and by catheterization if necessary.

Clothing.

For the journey to the operating room the patient is clad in loose, simple clothing, and plenty of it according to the season. As a rule a short nightgown reinforced over the chest with a piece of flannel, loosely-fitting stockings, and a suitable number of blankets will comprise the wearing apparel.

NURSING DURING THE INDUCTION OF ANESTHESIA

The duties of the attending nurse during the induction of anesthesia will vary somewhat with the anesthetic and the method of its administration so they may perhaps be best presented under the headings of the more commonly used anesthetics as follows:

Ether.

This anesthetic will be administered, as we already know, through either the inhalation of its vapor or the instillation into the rectum of a mixture of the liquid with oil. In both cases the anesthesia will be general, of

course, but it will come about in respectively different ways and so the initial nursing care as between the two methods of administration will be quite unlike in most respects. Always, however, as in all induction of general anesthesia, promptest and best all-around results will be obtained in an atmosphere of quietness and seclusion and for just about the same reasons that one falls more quickly and comfortably into a normal sleep when distractions, especially those of the sense of hearing (one of the last to be anesthetized) are absent. Accordingly, one attending a patient during the induction of ether anesthesia aims first of all to be as quiet and as unobtrusive as possible in all respects and to maintain surroundings of like nature.

Under Inhalation. Ether has a disagreeable odor for most persons; it is irritating to the respiratory tract, often causing coughing and choking at first; and when it first begins to take effect it is exhilarating and exciting. Therefore, even though partial insensibility will usually be established first (at least with adults) by the less disagreeable nitrous oxide gas, most patients will resist ether to some degree--voluntarily at first and involuntarily later--and so an important function of the assisting nurse will be to restrain them from their usual efforts to remove the inhaler, first of all, and to arise upon, and even escape from, the table. To control the legs it is sometimes customary to bind them (not too tightly) to the table with a strong strap placed immediately above the knees. With a strong and relatively healthy patient, which is the type most likely to cause trouble, this precaution may be necessary, especially if there are not enough assistants available to control him otherwise (for one assistant cannot manage such a subject), but it will be exciting and distressing to some patients and should not be adopted unless absolutely necessary. For the more impressionable patients a good plan will be to have this strap ready and to defer adjustment of it till a degree of unconsciousness exists.

As for the arms, most patients will be reassured by having them supported gently and casually. With strong patients who may be expected to be exceptionally hard to control it will be best to ask them to place their hands comfortably upon the table at their sides and to turn the palms downward. The nurse can then place a hand upon each wrist (standing with face toward the anesthetist) and thus be prepared for the worst, for pressure upon the wrists can fairly well prevent the patient from turning his palms from the table and unless he can do that he cannot cause much trouble. This will be an unnecessary precaution, however, for many patients and the best rule in such cases is to leave the hands where they have been placed voluntarily and then to place one's own hands upon the patient's wrists or forearms in such a way as to be prepared for any sudden attempt to move undesirably. In supporting arms and hands of ether patients in this way, one is well warned to avoid the grasp of a patient in the stage of excitement because a strong patient can entirely overpower a nurse, especially if his grip should happen to close upon her hand, and he may even injure her.

However, anesthetists will differ as to the handling of patients during the period of excitement. Some will prefer absolute resistance from the beginning to all movements, especially of the hands, and others will act upon the belief that early resistance to these efforts only aggravates them and will therefore advise permitting any activity which does not displace the

inhaler or endanger either patient or attendants. In the absence of advice to the contrary the nurse's wiser undertaking is the latter.

When not occupied otherwise the nurse follows the pulse as the patient goes under an anesthetic. With ether it is the rule for the pulse to increase somewhat in force and frequency in the early stages of the anesthesia, but extreme and sudden increase in frequency and of course other abnormal developments will be matters of concern.

Under Rectal Instillation. When ether is to be administered rectally, all treatment including the instillation of the ether, may be given before the patient is taken to the operating room. The morphine or other general sedative and the local one (usually the chloretone suppository) will be given perhaps two hours before the operation, the ether one hour before, and as a preparation for this period, and during it, all known "sedative" nursing measures will be in order with such variations as the anesthetist will prefer.

With this form of ether anesthesia there will be little or no excitement and the patient will regularly pass over uneventfully as into a sound sleep and be ready for the operation within perhaps forty minutes. Constant observation is necessary, of course, especially of the respirations, because irregularities are always possible.

Chloroform

From the nurse's standpoint the induction of chloroform anesthesia is regularly less eventful than that of ether by inhalation. That is, chloroform is more likely to depress than to exhilarate, though there is sometimes a short stage of excitement, but in any case patients should not be permitted to exert themselves while going under this anesthetic--it depresses the heart and may cause syncope during the period of induction which is the most critical time with chloroform.

The pulse of the chloroform subject is of comparative importance. While chloroform depresses the heart, one following the pulse may notice in the very beginning of the administration a slight quickening of it and an increase of its force. Very soon, however, there will be a gradual decrease of both which will probably extend below the level observed before the anesthetic was started. Extremes in either direction are, of course, danger signals.

Nitrous Oxide.

The induction period for this gas (usually administered in combination with oxygen) is very short, lasting only a few seconds and there will be little or no excitement, so the nurse's duties will not extend much beyond assisting the anesthetist in keeping the patient composed so that he will breathe deeply and regularly. General precautions against excitability should always be taken, however, as they will be helpful occasionally.

With nitrous oxide the pulse should not show much change and should be regular, full and quiet.

This anesthetic will usually be given (except to very young children) as a comparatively pleasant introduction to ether, but the effects to be watched for in that case are those of ether because the gas is used for but a few moments.

Ethylene

The induction period for this gas will follow a course similar to that of nitrous oxide. There will probably be little excitement but one should always be prepared to control movements of the arms and legs.

The pulse is probably not much affected by ethylene but it should be followed as with all anesthetics because of the always possible irregularity of effect.

Ethylene is a highly explosive gas which calls for the exclusion from the room in which it is being used of all sources of ignition such as a gas flame, a lighted match, X-ray apparatus, a sparking electric motor, the actual cautery, etc.

Ethyl Chloride

This is not a very safe anesthetic and therefore it is not in general use for prolonged anesthesia, but it is popular in some communities for operations and painful dressings which require only a few moments. Since the anesthesia for such purposes will not be carried to the stage of entire relaxation the attendance of the nurse will be required throughout to restrain hands, the part being operated upon, etc. Vomiting is likely to occur very soon after the withdrawal of the anesthetic.

Ethyl chloride is considerably used also as a local anesthetic for quick incisions, as of a superficial abscess. Under ordinary conditions of pressure and temperature it is a gas but a very slight pressure converts it into a liquid so it usually comes compressed into a liquid form in a glass tube fitted with a spring valve by means of which it can be released in the form of a spray. Thus a spray of the fluid may be applied to the skin (holding the tube at a distance of a foot or so) where evaporation will rapidly take place, extracting heat from the part and thus "freezing" it (till it appears blanched) so that an incision can be made without pain.

Avertin.

This anesthetic will be administered rectally perhaps thirty minutes before the operation and it will have been preceded by all of the nursing attentions for quietness and composure and by morphine and the chloretone suppository as in the rectal administration of ether.

Avertin anesthesia regularly comes about uneventfully, patients being asleep within a very few minutes and they are usually ready for the operation within half an hour. However, the drug depresses respirations very actively so patients must be watched constantly for this effect, as well as for any other irregularity, even mild excitement, for example, occurring in an occasional case.

The pulse may become slightly slower under this drug and the respirations will be slower also and somewhat shallower than normal.

Local Anesthesia.

When novocain or any of the other similar locally acting anesthetics are used, patients will of course be conscious, and though they usually will have had a dose of morphine or some other sedative some of them will require considerable nursing attention while the anesthetic is being injected, and it will sometimes be the nurse's duty to attend them throughout the operation. The important requirements of these patients will be diversion of attention from what is taking place at the wound. Guards or screens are always provided on an operating table to shield the patient from the sights of the operation when that is possible but the unavoidable noises of instruments, the various staff activities, etc., are not so easily "screened," hence the nursing diversions such as conversation; in some cases sips of drinks, especially water or perhaps only cracked ice; the radio possibly, especially with earphones; a short smoke sometimes; and anything else that can be devised to suit the particular disposition and condition of the patient and which does not interfere with the operation.

Meanwhile, the pulse is followed, of course, and the patient's reaction in general, observed because, like most drugs, local anesthetics are toxic to an occasional patient. The toxic symptoms to be anticipated under these anesthetics are rapid and feeble pulse, depression of respiration, pallor, nausea and vomiting, and syncope occasionally. And sometimes moderate excitement, manifested chiefly in talkativeness, will occur.

Chapter XI

POSTOPERATIVE AND POSTANESTHETIC CARE

Upon the conclusion of the operation the transference of the patient from the operating room to his bed will usually be a nursing responsibility, and the first requirement for this is plenty of blankets (heated ones in cold weather) according to the risk which must be run of chilling in hallways and elevators which are almost certain to be of a lower temperature than the operating room. During anesthesia, especially under ether, there may have been profuse perspiration, and in any case, whatever the anesthetic, the patient's general resistance will have been strained by any but the most minor of operations and often it will have been greatly lowered. Therefore, there will be increased susceptibility to the various possible consequences of sudden change of temperature and excessively rapid loss of heat by evaporation from the surface of the body. Pneumonia, for example, is a possibility to be feared after anesthesia and operation, and though exposure in this way is not the only cause to which postoperative pneumonia may be ascribed from time to time, it may very easily be one of them. And there are other ill effects which may follow neglect in this respect, as will appear later.

Another matter to which special nursing attention must be given at this time is that of quiet and gentle handling of the patient in course of transference from the operating table to the stretcher and from stretcher to bed. Often when ether or chloroform subjects are handled in this way they will remain comfortably asleep till the anesthetic has been largely eliminated and will thus be spared the discomforts and dangers of excitement and vomiting which are very likely to be brought on, and certainly are aggravated if they already exist, by rough handling during the recovery period. And a subject of any other anesthetic or operation will respond correspondingly to gentle and considerate bodily treatment because every disturbance at this time makes just that much more of a levy upon an already more or less reduced vitality. Rest and quietness are good medicines for almost any of our ailments and they produce their effects when we are under an anesthetic and unconscious of them even as they do when we are keenly awake to them. Moreover, there is the fresh operative wound to remember as faring best when disturbed least.

For at least ether and chloroform subjects the bed will have been made up previously so that the patient will lie between blankets (except in very hot weather) during the period of recovery, and seriously ill patients (and sometimes others), whatever the anesthetic, may require this same protection for a body whose normal balance between production and loss of heat may have been disturbed by the strain of the operation. And in cold weather a bed which is to receive a patient from the operating table is well warmed with hot water bottles, electric heating pads, or any other suitable source of heat available.

For the same reason that blankets are needed at this time the temperature of the patient's room is kept evenly regulated (around 70° F. when possible) though with as much out-door air as the season will permit, particularly in those cases where the anesthetic vapor (ether and chloroform) is being constantly exhaled into the atmosphere of the room.

Immediately upon the return of a patient from the operating room the temperature, pulse and respirations are taken and recorded and then they are watched very closely--the pulse and respirations in fact constantly for the first few hours at least--for the various danger signals they may give, as will be reviewed presently.

As early as possible one carefully inspects the condition of the entire body of this patient who has been on a really perilous journey to, through, and from the operating room, to see that everything is as it should be. In particular the location, condition, and nature of the wound dressings must be at once determined, for every wound dressing must be watched for bleeding, some for drainage of various kinds, and all must be protected and kept in place as a matter of course. The condition of the surface of the body--whether it is warm and dry, or cold and clammy, etc.--must be determined, the feet and hands being especially important parts to observe in this respect, subnormal surface temperature of course, calling for the application of heat by means of hot water bottles, etc., and often warm drinks (when permissible and tolerated) and even hot rectal injections will be employed to restore normal bodily warmth. Incidentally, the warning cannot be too often recalled that when heat is applied to these unconscious or devitalized patients more than the usual precautions must be taken to safeguard them against burns.

The gown worn in the operating room, which will usually be more or less wet from perspiration, is replaced by a fresh one and a perspiring body is of course dried and kept so as far as possible, the prevention of loss of heat through evaporation of perspiration from the surface of the body going a long way toward bringing about the warmth which many of these patients will lack.

After the return of consciousness no two patients can be treated alike in all these matters of blankets, room temperature, etc., and individual feelings are then consulted within the limits of safety. And when the anesthetic has been light or short, or of the local variety, the more extensive precautions may be relaxed from the first and sometimes they may be omitted entirely, but of course in all such matters, one inclines toward overcautiousness and never takes a chance.

Likewise, the time for the removal of the special blankets will have to be a matter of judgment based upon the patient's general condition and comfort, the anesthetic, the season of the year, etc. In most cases, however, the two blankets should not be removed at the same time, the top one being retained perhaps several hours longer than the lower one.

While events of recovery will be determined by many differing factors, there is a general course which may be expected from each of the anesthetics regardless of other circumstances, and since most of these sequelae of the anesthetic proper will appear and have to be met before many of the others develop, it will be logical to discuss the anesthetics individually first and after that the other possibilities which may or may not be related to the anesthetic.

RECOVERY FROM THE ANESTHETICS

Ether.

Recovery from this anesthetic calls for very watchful nursing, and patients should not be left out of sight for one moment until consciousness is established because whatever aid they may need during this time must be given promptly.

Provision should be made early for restraint because all the efforts incident to the stage of excitement in the induction of the anesthesia may be repeated during recovery. The favorite attempt of these patients is to get out of bed and if there are not enough assistants to control them a restraining sheet should be fastened across the bed just above the knees. This will be of enough assistance as a rule so that one nurse can master the situation.

From the very earliest moment the respirations must be watched closely because there are many respiratory complications which may arise before consciousness returns. First of all, mucus and saliva are secreted very profusely under ether and these may collect in the throat and prevent the free passage of air, and vomitus may do the same. This accumulation can usually be prevented by keeping the patient's head turned to one side during recovery or, if permissible, by proning the entire body to one side, both of which measures allow any fluid present to run out of the mouth. Also, this position tends to throw the tongue forward and away from the posterior wall of the pharynx, and this will be of the utmost importance in a few cases in which a swollen or very flabby tongue will persistently block the pharynx otherwise. In cases of persistent tendency of the tongue, thus to occlude the throat, the simple holding forward of the lower jaw may overcome the difficulty as this carries the tongue forward also. This is often difficult to learn to do properly, but if one first makes sure that the teeth are not locked together and then thrusts the lower teeth in front of the upper ones, or as nearly so as possible, all that is possible by this measure will have been accomplished. Sometimes, however, it may be necessary to reach into the mouth with a pair of tongue forceps or the fingers covered with a towel or piece of gauze and pull the tongue forward and swab out the fluid with a sponge on a holder. For this it will be necessary to hold the mouth open with a gag of some kind so as to prevent biting of the fingers, the tongue, or the forceps. Occasionally a spasm of the jaw will accompany this condition and the patient will become very cyanotic. This calls for quick and vigorous action in prying the mouth open with a gag and relieving the obstruction as just described. Or, a large rubber catheter may be passed into the throat through a chance opening where a tooth is missing or a small one through the nostril, the air thus admitted through the tube relieving the spasm promptly as a rule.

Regularly the patient recovering from ether will breathe less deeply and vigorously than normally because, though ether acts as a respiratory stimulant early in its administration, it eventually tends to depress the respiratory nerve center. It should be remembered, however, that sedatives, especially morphine, may be contributing to such depression and allowance

can be made on that account for abnormally slow and shallow respirations, but one should not be too slow to be alarmed by respiratory depression after an anesthetic. The color of the face, or more particularly of the lips and ears, will be a good guide as to whether or not sufficient oxygen is being inhaled, and this symptom will often be good enough despite slow and shallow respirations. In cases of extreme depression, while waiting for help, vigorous rubbing of the lips and face with a piece of gauze or a coarse towel may stimulate respiration somewhat and if this does not suffice artificial respiration must be the next step. However, if the color and pulse are good and the patient is breathing unobstructedly the best treatment is to let him alone, for many will pass unconsciously from their anesthesia into a sound sleep from which they will awake in an hour or two fully recovered and greatly benefitted by thus having passed away time which otherwise would have been unpleasant at best.

Nausea and vomiting will occur in a comparatively large percentage of ether cases. This should not persist for more than an hour or two though an occasional patient may be thus annoyed much longer, morphine being under suspicion somewhat as a possible cause of this prolonged nausea and vomiting in some instances. As pointed out above, it is very advantageous to have the patient turned to one side so as to encourage the outflow of fluids from the mouth and this is especially important during vomiting because otherwise vomitus may be inhaled and so cause asphyxia, and it is also possible that some cases of that is often called "ether pneumonia" are caused by this aspiration of vomitus. Also, this vomitus must be prevented from reaching the eyes because troublesome and painful cases of conjunctivitis can sometimes be attributed to it, probably due to the fact that some of the exhaled ether vapor has become dissolved in the mouth fluids. When consciousness has returned to some degree the coughing reflex will function and the patient will then be able to save himself from the asphyxial danger, but in any case the head should be held to one side during vomiting and the mouth afterward swabbed clean if necessary. The character of the vomitus should always be noted. In ether cases there is likely to be much mucus because ether stimulates all secretions more than the other anesthetics, and there will be indications of bile sometimes. If blood is present its source must be accounted for. However, if the operation has been upon some part of the mouth, nose, throat, or stomach it may be expected that blood which was swallowed or spilled during the operation will be vomited in a partially digested form, often called "coffee grounds" because it will be brownish and more or less granular instead of red and fluid. Bright red blood will be more alarming but a bitten tongue or a loosened tooth may be the source of this.

The pulse, of course, is watched closely. It will be somewhat depressed, at least for a short time after the patient's return to bed, but within an hour or so it regularly shows signs of recuperation.

There are several odd manifestations which may accompany recovery from ether, such as tremor, hiccough, etc., but they are usually transitory and not seriously significant unless they persist unduly. It is very likely that the patient who manifested the tremor during the induction of the anesthesia will do so again as he recovers, but the mistake must not be made of overlooking a real chill in these patients for the two conditions are

easily confused and a chil , of course, is not to be taken lightly. Likewise, persistent hiccough should be regarded seriously because, aside from being very distressing to the patient it may signify something deeper than a mere irregularity of recovery of consciousness.

Administrations by mouth will be governed by the surgical condition of the patient and individual preferences of surgeons. Patients recovering from ether will be excessively thirsty, chiefly because of the loss of fluid through perspiration and vomiting, and from the earliest moment of consciousness, they will desire drinks of water much more frequently and in larger quantities than they can tolerate as a rule without nausea and vomiting. Usually they can be kept sufficiently satisfied and comfortable by the frequent administration of sips of water (hot water often being preferred) and moist cool compresses to the lips till the stomach becomes more tolerant, and then the dosage of water can be gradually increased as tolerance improves. Small pieces of cracked ice frequently given will often help too, but some surgeons will disapprove of this, as also of cold water, in abdominal cases on the ground that it is a contributing cause of abdominal distention. Another course sometimes followed is that of giving water very abundantly with the express intention of inducing vigorous vomiting and thus thoroughly washing out the stomach and so stimulating and quieting it, but this will not be done without authorization because there are many cases in which such forced vomiting would be dangerous and it is usually painful and otherwise distressing to the patient. After stomach operations and others where fluid by mouth will be directly injurious to the wound itself, curtailment will be more rigorous and prolonged, but rectal irrigations or instillations of water or salt solution and hypodermoclyses or infusions of salt solution may be used as substitute sources of fluid, and often large quantities of salt solution will be given in one of these ways as a routine after serious operations for the purpose of bringing body fluids in general up to normal quantity and concentration; and glucose solution may be used also in the intravenous injections for its food value and for its effect of preventing or counteracting the condition of acidosis which sometimes develops after anesthesia. This kind of treatment, however, is not peculiar to subjects of ether anesthesia and more will be said about it later.

In cases where water by mouth is thus restricted the uncomfortable parched condition of the mouth can be relieved by sponging with a lubricating mouth wash--one containing glycerin, for example. Also many patients will be annoyed by the lingering and disagreeable taste of the ether and this too may often be relieved by a mouth wash--a pleasantly flavored one in this case, such as one containing lemon juice, tincture of myrrh, etc., or one of the agreeable commercial solutions, according to the preference of the patient.

The point at which food will be given after ether will be determined by many things in addition to the anesthetic itself.

When the ether has been administered colonically, a colon irrigation may be given immediately upon the patient's return from the operating room for the purpose of washing out any remaining ether. Water merely warm (not above body temperature) will be used for this because an irrigation of a

higher temperature will immediately vaporize the ether instead of simply carrying it out in fluid form. Following this irrigation there may be an instillation of a few ounces of olive oil to be retained for the purpose of allaying any local irritation that may have been caused by the ether.

After colonic ether anesthesia the extreme interferences with respiration so common after inhalation will be exceptional, and nausea and vomiting also will not be so troublesome, the patient being likely to sleep or at least to rest quietly during recovery. The numerous drugs given previously however, (and paraldehyde may have been given with the ether) must be kept in mind.

Chloroform.

Recovery from chloroform requires the same watchful nursing as does that from ether, but it is likely to be less eventful. As a rule the patient will remain quiet and pass from the anesthesia into sound sleep.

However, nervous and excitable patients may have a period of excitement which will necessitate the same precautions as to restraint described for ether subjects, but such cases will be comparatively rare.

Chloroform does not often produce the profuse secretion of mucus nor the swollen tongue so usual under ether and therefore these patients will not be so prone to respiratory obstructions. In fact, it is rare that the respirations manifest any noteworthy feature beyond a characteristic softness and quietness.

Nausea and vomiting will also be less frequent, though when vomiting does occur, it is more likely to be severe and persistent than after ether. The precautions mentioned for cases of vomiting after ether apply equally to chloroform subjects with the addition of the one discussed in the following paragraph.

Chloroform subjects very frequently exhibit considerable pallor and this will usually be accompanied by marked depression of the pulse. These two symptoms are especially likely to occur just before or during vomiting, and as their severity will usually depend upon the severity of the vomiting and the excitement accompanying it, the nurse can often prevent considerable exhaustion and even syncope by judicious management of such cases.

The pulse is likely to be comparatively feeble throughout recovery from chloroform and, as pointed out in the preceding paragraph, is subject to periods of great depression. This makes it advisable to exercise special care to keep these patients quiet although, as we have said, quiet recovery is provided naturally in the great majority of chloroform subjects.

Hiccough will occur occasionally but as in the case of ether it will not often be of great consequence.

The administration of food after chloroform will be governed by various circumstances as will be reviewed when we come to the discussion of diet in general.

Nitrous Oxide.

Patients who have had this gas will recover within a very few minutes as a rule--usually before they leave the operating table.

Nausea and vomiting will occur but not often seriously.

Since morphine and atropine are regularly given before the administration of the anesthetic their effects must be taken into consideration in the postoperative nursing. Many of these patients will be languid and may sleep for a considerable time though a disturbing headache is not uncommon and sometimes it may be very persistent.

The pulse and respirations should be watched closely for some time, of course, but as a rule recovery will be uneventful in these respects insofar as the anesthetic alone is concerned.

Nitrous oxide subjects will not be excessively thirsty and will regularly be able to take nourishment comparatively soon after recovery, though of course, there will often be surgical reasons for giving even water sparingly for a while.

Ethylene.

Recovery from ethylene is very rapid as a rule, requiring only a few minutes. There will be nausea and vomiting in some cases, but they will not often last long and are not likely to be severe.

The pulse and respirations after ethylene will usually follow an uneventful course except that they may be affected by the morphine which will often have been given previously.

The administration of water and nourishment after ethylene will usually not be greatly restricted except, as is possible after any anesthetic for operative reasons, but since this gas does not cause undue perspiration these patients will probably not be excessively thirsty.

Ethyl Chloride.

Complete recovery of consciousness after ethyl chloride takes place within a very few minutes. Occasionally there will be a case of collapse but this will usually occur before the responsibility for the patient has been transferred from the anesthetist to the nurse. However, when collapse does occur, it is so sudden and profound that its possibility must always be kept in mind.

Headache, nausea and vomiting occur frequently and they may be severe.

The pulse and respirations will exhibit no signs peculiar to this anesthetic except, as mentioned above, those attendant upon the very sudden collapse which may occur during administration or immediately afterward.

The administration of water and nourishment will be determined by tolerance for them and this will occasionally be poor out of all proportion to the shortness and lightness of the anesthesia for which this drug will be used.

Avertin.

Patients who have had this anesthetic will usually remain as in a quiet sleep for differing lengths of time--one to several hours—but they must be constantly watched till voluntary control of the tongue and lower jaw has been regained. These parts tend to sag backward and cause occlusion of the pharynx in all anesthesia affecting them and this tendency is especially prolonged and dangerous under avertin because of the comparatively slow and gradual recovery. Also avertin is a respiratory depressant, respirations under it usually being slower and shallower than normal. Often an airway will be kept in place as long as tolerated by the patient, this holding the tongue away from the posterior wall of the pharynx and so keeping the air tract free there; and when the surgical condition will permit, which it will do oftener than not, the patient should be propped on his side, this having the effect, as pointed out under the discussion of ether, of preventing the extreme backward sag of the tongue and lower jaw.

Avertin does not cause abnormal secretion of saliva nor mucus and is not frequently followed by nausea and vomiting so the danger of asphyxia from these sources is either absent or minor.

The pulse is usually not affected importantly by this anesthetic except that under heavy dosage there may be a fall in blood pressure as indicated principally by a weak, soft and rapid pulse.

Upon return of consciousness avertin patients regularly are able to drink water as freely as desired or permissible surgically, though they are not likely to be excessively thirsty because the anesthetic does not cause abnormal perspiration nor considerable loss of fluid (as a rule) by vomiting, and their diet subsequently will not be materially complicated by the anesthetic.

Avertin is what is known as a basal anesthetic as distinguished from a "complete" anesthetic, such as ether. That is, it cannot safely be used in sufficiently large dosage to insure the profound anesthesia necessary for the more extensive major operations. Therefore, a safe dosage, calculated very accurately upon the basis of the actual body weight of the patient, is given and if this is not enough to produce the desired relaxation, a light administration of ether, nitrous oxide, ethylene, or a local anesthetic can be added as needed. While avertin patients will thus often have had also a "supplemental" anesthetic, they will probably not have had enough of it to modify consequentially the characteristics of avertin recovery.

Local Anesthetics.

Except in spinal anesthesia, patients who have had one of the local anesthetics will not often have symptoms directly referable to the anesthetic, and water, other fluids, and diet generally will regularly be administered

as permitted by the operation and the general condition of the patient. However, as previously pointed out, there will be an occasional case of general depression under these drugs with extreme pallor, rapid and feeble pulse, dyspnea, nausea and vomiting, etc. Keeping the head low will help these patients, usually the foot of the bed will be elevated, and of course, there will be various stimulating treatments to be administered, such as ephedrine or epinephrine hypodermically or a saline infusion with one of these drugs added, and sometimes artificial respiration may be necessary.

When spinal anesthesia has been used the patient is kept lying on his back and with the foot of the bed elevated (the Trendelenburg position) for three hours or more after the operation, or till normal sensation returns throughout the lower extremities; this position usually being required constantly from the time the anesthetic is injected till complete recovery, because of the special danger otherwise of cerebral anemia and respiratory failure, with symptoms are enumerated above. In order that the Trendelenburg position may be maintained, even during transportation, there are available wheel stretchers which may be inclined like the operating table.

RECOVERY IN GENERAL

Pain.

During at least the first twelve hours after the anesthetic has worn off, the patient will naturally be subject to pain in the region of the wound; also there will often be backache and distressing pain of various kinds and degrees in other parts of the body (arms, legs, etc.) as a result of prolonged and strained position upon the operating table; and headache is a not infrequent sequel to some of the anesthetics and to others of the numerous trying experiences which may precede and accompany an operation.

The prevention and relief of pain as a part of surgery, as it is of all branches of treatment of mortal ailments, and so a large part of our attention in the early hours after an operation will be devoted to this matter of saving our patients, as far as possible, from the immediate and the often far-reaching strain which pain can cause. Morphine is the classical antidote for pain and it will usually be given generously immediately postoperatively, and sometimes even prophylactically before the effect of the anesthetic has been fully spent, and then afterward as needed; or, for reasons of preference upon the part of the surgeon or because of many possible circumstances in the case, the milder drug, codeine, may be used instead. After twelve or certainly twenty-four hours, unless complications intervene, the severe postoperative pain in the wound subsides and leaves only a soreness (though real pain will recur transiently upon motion), so after that time, if any drugs at all are needed, such less potent and on the whole, less objectionable ones as luminal, medinal, sodium amytal, aspirin, or one of the many other like ones, will suffice. That is, morphine is of course, a powerfully habit-forming drug; some surgeons believe it tends to cause intestinal stasis and therefore to encourage distention in abdominal cases; as mentioned before, it is regarded by some authorities as encouraging nausea and vomiting in some instances; and so on the whole, effective as it is in the prevention and cure of pain (and it of course induces sleep and rest

at the same time), it must always be used with reserve and caution. And as a matter of fact, any narcotic or hypnotic drug must be used with caution against the possible tendency of any patient to become habitually dependent upon it.

In any case, however, there is much that good nursing can do to prevent and alleviate pain and it will be a matter of nursing pride to exhaust all these possibilities as the more desirable and more natural means, on the whole, for bringing about comfort and even sleep. A change of position, a pillow here and there (under the knees, the back--anywhere) to give support and restful change; a palatable drink; a soothing alcohol rub, at least of the back; attention as far as possible to the feelings of the patient as to room temperature, bed covering, etc.; and above all, watchfulness over dressings, bandages, splints, casts, or any other appliances to see that they are in proper adjustment, will all go a long way toward obviating the always only secondarily desirable use of drugs. And of course, there will often be the mental factor to meet with whatever can be done to maintain the patient's morale.

There are many other treatments for pain, of course, but they will be best brought out as we come to treatment of individual diseases.

In many cases the temperament of the patient will have a great deal to do with the success of any of our treatments, even that of some of the drugs. It must be true that some persons experience more pain than others under any given condition, but it is also true that some will complain more than others in any case. Also, some parts of the body are naturally more painful when disordered than others--the abdomen perhaps chief among them; the hand is naturally more painful than the foot, and so on. But after all, no matter what the temperament or the afflicted part, we shall have only the single purpose of bringing about comfort, contentment, and, in its turn, sleep.

In describing pain for records and reports, it will be necessary to be familiar with various descriptive terms for it. These will often be supplied spontaneously by the patient and otherwise they will usually be obtainable upon questioning and will be essentially as follows: Dull, aching, burning, boring, sharp, stabbing, darting, cramp-like, throbbing, etc. Also, it should be noted whether the pain is constant or intermittent as, for instance, coming and going with respiration; whether or not it is worse at night, has any reference to meals or to anything else which the patient may do or have done to him.

Temperature.

For two or three days immediately following an operation, the patient's temperature may be slightly elevated without any special significance but after that time the symptom will usually mean infection of some part, as will be discussed presently under postoperative complications.

Voiding of Urine.

This is always a matter of close attention after operation because quite often it will not take place, at least soon enough, and treatment will be necessary to remedy the condition. Inability to void voluntarily after operation will be due to one or the other of two possible post-operative complications, retention and suppression of urine.

Diet.

Administrations by mouth after operation will be determined by one or more of numerous possible circumstances. Under recovery from the anesthetics their individual requirements in this respect have been mentioned, and in addition to those there will be such factors as the surgery which has been done, the condition of the patient otherwise, and the differing opinions of surgeons as to what is best in any case. Ether, and to a lesser degree chloroform, as also some of the other anesthetics, occasionally, as we have seen, will impose restrictions even as to water for the first few hours and this of course, will necessitate corresponding postponement of the administration of anything more substantial, no matter how minor the operation nor how otherwise satisfactory the condition of the patient. An operation upon the stomach imposes precautions and restrictions as to diet which will be entirely foreign to an operation upon the hand, for example, or in fact almost any other part, and the anesthetic will have little or nothing to do with the case. A patient who had diabetes, nephritis, a chronically disordered digestive apparatus, or any other chronic condition before operation will have it afterward, of course, and so will require special consideration on that account no matter what the anesthetic, operation nor anything else. A patient who does not withstand his operation well, whatever the reason, will require more dietary doctoring and nursing than those who come out of it, as so many do, apparently unscathed in every respect. A local anesthetic may affect diet scarcely at all. And so could be cited at much greater length modifying factors in the matter of diet after surgery, the subject thus being one which has to be eternally studied and kept in hand for no telling what exigency.

However, oftener than not postoperative patients will fit into a routine dietary and this will be broadly as follows: If there has been no nausea, or when it appears to have passed away, water may be given as freely as the patient desires. After twenty-four hours, or possibly sooner, fluids of almost any kind--orange or lemon albumen, fat-free meat broths, buttermilk, malted milk, coffee, etc.--will be permissible. After forty-eight hours an enema will be a common prescription, and after that a soft solid diet will be the routine with the addition to the fluids of such foods as cereals with milk, soft-boiled or poached eggs with toast, cream soups, baked potato, custards, fruit jellies, baked apple, ice cream, etc. And after twenty-four hours of this, if all goes well, a light diet will be prescribed, this adding to the foregoing such foods as chicken, lamb chop, rare beefsteak, puree of such vegetables as peas, carrots, string beans, spinach. From this a gradual transition will be made to a regular diet which will include anything the patient likes or can tolerate, just as in health.

Dressing of the Wound.

A clean wound, which is to say one which was entirely closed upon completion of the operation, is free from infection, and is proceeding regularly with the healing process, will usually require no attention except to see that its dressings are not disturbed till the fifth day after operation at the earliest, and perhaps oftener the seventh, when the skin sutures will be removed and a fresh dressing applied to remain till the incision line is entirely covered over with new skin. However, if the patient's temperature should remain high, or if pain should persist in the wound, infection will be suspected and so there will have to be an examination and of course, a redressing of the wound whenever such symptoms require it. And a wound which is draining will have to be dressed as often as necessary to keep it clean and comfortable--several times a day in extreme cases.

Convalescence.

The point at which the patient will be allowed out of bed and thence forward gradually to resume normal activity will depend upon many different circumstances--the surgery done, its outcome, the patient's recuperative powers, and so forth.

In any case, however, after an operation of any consequence, best all-around results will follow if a suitable period of rest, recreation and light occupation under trained guidance intervenes between the period of hospitalization and the return to serious work of any kind. Thus, ideally, convalescence consists of several weeks of out-door diversion--playing light games, walking, etc.--preferably in the open country; of such indoor constructive occupations as needle work, basketry, hand leather work, weaving, light woodwork, etc.; entertainment according to the patient's taste; and of course, of proper diet and sleep.

Many hospitals have Social Service and Occupational Therapy departments staffed with nurses and other specialists whose duty it is to arrange for as much as possible of this desirable convalescent treatment, and it will be a part of such a service also to relieve the minds of needy persons of worry about personal or financial matters during this period by enlisting the aid of relief agencies. Also, such a hospital service will direct the handicapped, such as those who have had amputations of limbs, those with heart conditions, pulmonary tuberculosis, etc., to the various agencies which exist for the readjustment of such persons to suitable new occupations; it will see that helpful recreational provision is made for children whose homes are not suitable for their convalescence; and so on in many other directions will be carried this effort to see to it that surgery is not undone nor defeated by a lack of enlightened convalescence from it.

Fortunately, the experience of hospitalization is a liberal education in itself for many patients in the matter of hygiene in general through the example of the routine required in the hospital and the advice regularly given there in any case as to subsequent habits, and in many cases this will be all that is necessary.

Follow-up

Many hospitals, clinics, and doctors individually will have a system whereunder patients will be requested to return periodically for observation as to results of their operations. This will be especially important where operations have been done for malignant disease, and in almost any case it will be a real form of health insurance for the patient and at the same time a source of satisfaction for the surgeon and a valuable means of addition to the general fund of surgical knowledge.

POSTOPERATIVE COMPLICATIONS

In the broad sense a "complication" is any disease or condition which exists with another disease, secondarily at first, but sometimes developing so as to become finally the major disease of the two. The very dangerous disease pneumonia, for example, frequently complicates a great many conditions, both medical and surgical, many of which would not of themselves be dangerous nor difficult to treat successfully.

We have considered some of the diseases which patients may already have when their surgical condition develops and which may need to be treated before it is safe to treat the surgical disease. From the surgical standpoint the surgical disease is the major one and anything which impedes its treatment is a complication, so these pre-existing diseases are complications of surgery, or more specifically "preoperative complications." But there are surgical interferences of another class which follow instead of preceding surgery and these are the ones which we are now about to discuss as postoperative complications. The principal ones of these are hemorrhage, shock, retention of urine, suppression of urine, abdominal distention, acute dilatation of stomach, disturbances of metabolism, peritonitis, intestinal obstruction, wound infection, rupture of the wound, pneumonia, massive collapse of the lung, thrombosis, phlebitis, and embolism.

Incidentally, postoperative complications are to be distinguished from the after-effects of anesthetics presented in the preceding section in that, for the most part, they are accidental or at least unforeseeable in most instances, and are relatively exceptional in occurrence, whereas the effects of the anesthetics are to be expected.

Hemorrhage.

A hemorrhage, or a bleeding, is an escape of blood from a blood vessel, surgical usage, however, rather defining hemorrhage more specifically as a profuse and dangerous bleeding.

Causes of Hemorrhage. Naturally, the blood vessels are involved in all types of injury and although large vessels are not always thus involved to the extent of being laid open and so discharging their blood, it is from the forceful injuries that by far the greater number of hemorrhages result. Thus a crushing injury may rupture an organ (liver, kidney, spleen, etc.) and its vessels; the end of a broken bone may pierce the vessels about it either immediately or later; and of course, the cutting, tearing and penetrating agents of injury may easily include a large vessel in what they do.

Also, ulceration and sloughing may invade the vessel walls eventually and so a hemorrhage may occur in a suppurating infection, in a cancerous tumor which has broken down in a deep and sloughing burn, in ulcers of the stomach and intestine, and in many other like conditions. Occasionally a ligature with which a large vessel has been tied in course of an operation will give way after the operation has been completed and so cause one of the most serious forms of hemorrhage sometimes after, even a comparatively simple operation. Sometimes there will be a serious type of hemorrhage in the case of a patient who comes into the hospital with a diagnosis of ectopic pregnancy because in that condition the Fallopian tube is in constant danger of becoming ruptured with profuse bleeding into the pelvic cavity. And there will be various other causes for hemorrhage from time to time.

Terminology of Hemorrhage. Hemorrhages as a whole, have a variety of characteristics so there are many different terms used in describing them.

When the blood is directly discharged upon the surface of the body, the hemorrhage is called external or evident; and when it remains within the body, as in the abdominal cavity, the stomach, or anywhere else internally, the hemorrhage is called an internal or concealed one.

When the bleeding is from an artery, it is an arterial hemorrhage in which case bright red blood will spurt with each systole of the heart, and to a great distance sometimes if the artery is open to the surface of the body. When a vein bleeds, it is a venous hemorrhage and darker red blood flows in a steady stream. And in capillary hemorrhage the blood will merely ooze slowly and steadily from many points throughout the bleeding area.

If the blood is vomited from the stomach, the term hematemesis is used. If it is coughed up from the lungs, the hemorrhage is called hemoptysis. If the urine contains blood the condition is called hematuria. If the stool contains blood, especially in the black and tarry form, as produced by the action of the intestinal fluids, the condition is called melena. The term epistaxis is often used for nosebleed. Then, there is the congenital named hemophilia in which there is a tendency to bleed easily and persistently, the subjects of it being commonly called "bleeders." Also extravasation of blood is naturally a form of hemorrhage. And there will be the anatomically distinguishing terms for hemorrhage such as cerebral, gastric, pulmonary, intestinal, renal, etc.

And finally, a primary hemorrhage is one which occurs at the time of injury, and a secondary hemorrhage is one which is delayed, as in an infection or the case of the faulty ligature already mentioned.

Symptoms of Hemorrhage. In the case of an internal hemorrhage or an external one which has not been noticed in time, the first symptoms to be detected are likely to be those of a weak and soft pulse and pallor of the skin. After serious loss of blood the pulse will be rapid as well as weak and easily compressed, the respirations will be rapid and shallow, the skin cold and perspiring as well as pallid, the temperature will be subnormal, and the patient will be extremely thirsty and will complain of disturbances

of sight and hearing such as flashes of light, vertigo, a ringing or roaring sound, etc. In mild cases the patient may be quiet and even listless but in extreme ones there will be great restlessness with anxious fear of suffocation, a sensation of pressure upon the chest, and a struggling and gasping for breath--a condition often spoken of as "air hunger." And of course, a lowered blood pressure will go with the reduced volume of blood.

It scarcely needs to be said that one makes frequent inspection of the wound dressings in postoperative nursing against this very serious and always possible eventuality of hemorrhage.

Emergency Arrest of Hemorrhage. Needless to say, a hemorrhage of more than very minor nature must be stopped at once. It is usually said that one cannot survive the loss of more than half of the body's blood, but many lives will succumb to a much smaller loss than that and even mild bleeding will be serious for some patients.

Fortunately, nature has several provisions of her own for the arrest of hemorrhage. Normal blood vessels are elastic and when they are severed the ends recoil and contract like a stretched and distended rubber tube would do, and in the case of the arteries and veins, the walls of which have several coats, the inner coat shrinks and curls inward with the result of at least partially plugging the opening. Then, once separated from the circulation, blood tends to clot, so if there is not too much pressure behind the blood current a clot will soon form about this barrier which the vessel has erected and the hemorrhage will be thus arrested by wholly natural measures. Small vessels very readily close themselves in this way, especially when they are kept quiet, and in some of the violent crushing and tearing injuries even the largest vessels may arrest their own hemorrhages by virtue of these natural reactions of contraction, retraction, and clot formation. Even arms and legs have been torn off in violent accidents without serious hemorrhage.

However, these natural responses are not always sufficient and under some circumstances they do not even take place. As long as the heart action remains vigorous, for example, clot formation may be prevented or a clot already formed may be dislodged by the forcefulness of the blood current. Arteries hardened by disease will have lost that means of self-defense which is dependent upon elasticity. The natural response is usually less successful when the vessel is not entirely cut in two than it is in complete severance. The vessels in some parts--the bones, scalp, and others--are not so well equipped with the power to contract and retract as are most others. Vessels in an infected and inflamed part, in scar tissue, and under other such abnormal conditions cannot respond normally. And in cases of "bleeders" a delay in clot formation will at least greatly delay spontaneous arrest of hemorrhage.

In any case of severe hemorrhage, however, one does not wait to see what nature can do but immediately administers an appropriate one of the following treatments.

An always-available means of stopping a flow of blood when the bleeding point is accessible is direct pressure upon it and unless a better method comes to mind instantly this is the one to apply till helps arrives or till something better can be managed, though sometimes nothing else can be done. If it is a small vessel that is bleeding a clot may soon form in it under this pressure and a cure be thus effected, as we already know, but for large vessels surgical treatment will usually have to follow.

A method which will cause less pain for the patient than that of pressure upon the wound, and which will at the same time circumvent the danger of wound contamination, is compression of the bleeding vessel at some distant point, remembering that an artery must be compressed at a point between the wound and the heart and a vein on the opposite side of the wound, and that the vessel must be pressed firmly against its associated bone. In severe bleeding, whether it appears to come from an artery or not, this control of the main artery will be the doubly-sure emergency measure because a deeply buried artery will not always be able to exhibit the characteristic spurt of blood at the surface and the flow will therefore appear like that from a vein, and in any case a vein cannot bleed if its contributing artery is blocked.

For an arm or leg in cases where pressure may need to be sustained for some time, a tourniquet may be applied. It must always be remembered, however, that a tourniquet obliterates not only the bleeding vessel but all the rest as well, so that the limb below it is deprived of all circulation and may therefore become gangrenous if the tourniquet is left on too long. An hour is about the longest time for which the tourniquet may be left on safely, after which it should be loosened very gradually and cautiously and not re-tightened till the bleeding recurs, this procedure being repeated till help arrives. Sometimes a clot will have formed in the bleeding vessel during this hour and bleeding will not recur at all, but the tourniquet should be left loosely in place and ready for instant tightening if that becomes necessary.

Elevation of the bleeding part as much as possible above the level of the heart will reduce somewhat the volume and force of the circulation in the bleeding vessel and so encourage clot formation. For head, neck or chest cases, the patient should be raised to the sitting position; for abdominal or pelvic bleeding the foot of the bed is elevated; and of course, arms and legs are easily propped high, though in a case of fracture, they will not be moved because of the danger of further injury by the bone fragments.

For internal or inaccessible hemorrhage, as from the throat, the lungs, stomach, abdomen or pelvis, ice applied externally will be helpful.

For nosebleed, which may sometimes be serious enough, the patient should be kept quiet in the sitting position and pressure should be applied to the nostril long enough for a clot to form (at least five minutes), and cold wet compresses or ice to the nose and the back of the neck at the same time will be helpful. In severe cases packing of the nostril with a strip of gauze may be necessary but this will not be a nursing treatment

except in extreme cases where the other treatments have failed and help is not available.

Operative Arrest of Hemorrhage. When a hemorrhage is not permanently arrested by first aid measures as just described some operative procedure will be necessary, various kinds being as follows:

When the vessel is readily accessible the usual operative treatment is ligation--a procedure wherein the end of the cut vessel is grasped with forceps (called also "hemostat," "artery clamp," etc.) and then tied with a catgut or occasionally a silk thread ligature.

Sometimes, if ligation is not found feasible, or if that operation must be delayed for some reason, such as poor condition of the patient, a bleeding would will be packed tightly with gauze.

Large vessels may be repaired by suturing of a slit or puncture of the wall, and a totally severed vessel can often be restored also by suturing the ends together.

In operations generally, where vessels of all sizes must be cut intentionally, hemorrhage is a matter of prevention rather than arrest except with very small vessels which can be grasped instantly with negligible loss of blood. That is, an important vessel will first be clamped in the hemostat and cut and ligated afterward, thus permitting almost no escape of blood.

These hemostatic forceps can be locked tightly and left in place as long as desired so they are often thus left on smaller vessels, especially near the surface of the wound, till the end of the operation when they can usually be removed safely without trying the vessel at all, the crushing of the vessel and the time allowed for clot formation being all that is necessary.

Occasionally a small superficial vessel will be closed by torsion which means that it will be twisted several times, or sometimes till the portion in the forceps is twisted off, this being a copy of the accidental occurrence already mentioned as often succeeding with large vessels in violent tearing and crushing accidents.

Heat by cauterization and diathermy is used somewhat also for control of bleeding from small vessels during operation, a sealing by searing and immediate clot formation being accomplished in this way.

In bone surgery a wax is sometimes pressed into persistently bleeding parts of the bones to serve as a mechanical barrier to the flow of blood in these vessels which, as already pointed out, do not readily occlude themselves, and which are also naturally difficult of access. "Horsley's" is a well-known bone wax, the base of it being beeswax.

Treatment after Hemorrhage. When the blood has been greatly reduced in volume, it will be important to keep that which remains circulating as plentifully as possible in the service of the vital organs and to this end the patient's head will be kept low (without pillows) and the foot of the bed elevated. As an additional measure for concentration of the circulation in the head and trunk, the feet and legs, the arms, and even the abdomen may be bandaged fairly firmly over a layer of non-absorbent cotton, the cotton serving the double purpose of evening the pressure and of keeping the parts warm. And of course, warmth of the body generally will be a special nursing responsibility for these extremely devitalized patients.

Contrary to what one might expect at first thought, heart stimulants will not be administered to these patients as a rule because the heart is not necessarily disordered by hemorrhage, its disability in the case being functional as a result of the lack of blood with which to carry on normally. Morphine, however, will probably be given freely for the usually necessary effect of quietness.

The great need of a patient who has had a severe hemorrhage is replacement of the lost blood. The body immediately undertakes this for itself but it will usually not succeed quickly enough, so blood will be given by transfusion, wherever that is possible, as the best and quickest means of filling the blood vessels again and so reviving heart action and raising the blood pressure. In the milder cases, or where blood is not available, infusion, hypodermoclysis or proctoclysis of salt solution will be given instead, and with an infusion may be included a dose of the astringent and hemostatic drug epinephrine (adrenalin, suprarenalin, etc.) for its effect of raising the blood pressure. Also, when possible, fluids by mouth will be forced for the aid they can give in restoring the lost body fluid.

Shock.

This is a condition in which the vital processes of the body--circulation, respiration, metabolism, etc.--are profoundly depressed, sometimes for only a few moments as in fainting, or syncope, and sometimes persistently and often fatally. It may occur either very suddenly or gradually, depending upon the cause.

Collapse is a term which is rather loosely used to designate what is virtually this same condition.

Symptoms of Shock. Sometimes a patient in shock will be unconscious but oftener only extremely listless and indifferent as to what is going on about him, though occasionally there is restlessness. The blood pressure will be greatly lowered, the pulse will be rapid and weak, the respirations rapid, shallow, labored, and sometimes "sighing," and the temperature is usually subnormal. The face will be pale and drawn, or sometimes cyanotic. Perspiration is often excessive (a process overactive instead of depressed), and the entire surface of the body will then be cold and clammy to the touch. Pain, while sometimes a contributing cause of the disorder, will usually be absent at its height.

Causes of Shock. Severe injury, including that of a serious operation, is the most frequent cause of shock but it may be brought about also by hemorrhage, toxic infection, poisoning by drugs, snake venom, etc., severe pain, sudden strong emotion such as fear or grief, and various psychic reactions to experiences or sights—some persons faint, for instance, at the sight of blood.

As to the pathology of shock, which is to say the changes which take place within the body to produce the effects observed, there is as yet no universally accepted explanation. For example, the major observed effect is that of great reduction in the volume of blood in circulation, but nobody knows for a certainty (except in hemorrhage) just what has become of the missing quantity of blood nor how nor why it came to be withdrawn from circulation. There has been a rather generally accepted theory that it was lying stagnant in the vessels of the trunk (the splanchnic, or visceral vessels) which had become greatly relaxed and dilated because of deranged nerve control (paralysis of the vasomotor system), but a theory of loss of fluid content of the blood in some way, possibly as a result of a toxemia, is now substituted by many investigators, though there are also many other complex theories under consideration in efforts to account for this puzzling condition.

In accordance with the exciting causes given above there will be such distinguishing terms for shock as these: Post-traumatic, postoperative or surgical (one type of post-traumatic), hemorrhagic, toxic, emotional, psychic, etc.

In surgery, of course, we are concerned principally with the graver form of shock as it follows accidental injury, or as a result of the injury of surgery itself or the anesthetic, or both, of hemorrhage in injury or operation, or of infection either as an accident after surgery or as the disease which necessitated the operation. Some of this will be unforeseeable and unpreventable, but there are many predisposing causes of surgical shock and so there is a great deal that can be done—and no small amount of it by nursing—at every point in the treatment of the patient, whether it be before, during or after operation, in the way of correcting such predispositions or of preventing their coming about.

Prevention of Shock. First of all, we have gone a long way toward the prevention of shock if we have succeeded with the mental preparation. That is, we shall have removed the emotional and psychic causes of it. And the narcotic drugs serve likewise.

Then, not the least of the purposes in the preoperative building up of patients who have complicating diseases and other unfavorable conditions, and in the provision of sleep and rest in all cases, is this same one of fortification against shock.

In keeping with the theory of loss of fluid from the circulation as a cause of shock, proctoclyses, and in more serious cases hypodermoclyses and infusions of salt solution will be given preoperatively, occasionally during operation, and again after it, as a prophylactic measure against the complication, and the attention to fluid intake pre-operatively has partial reference also to shock.

In fact, almost every item of the preparation, designed as it is lighten the patient's burden of the operation in some respect, will have at least an indirect bearing upon shock prevention.

When we come to the subject of operating room management we shall find that the operating room is kept warmer than is customary for living quarters, and that we are prepared to supply warm blankets, hot water bottles, etc., for patients in poor condition--all this being largely in the interest of shock prevention.

Because of the differences of action among the anesthetics selection of the one best suited to the patient's condition will have the element of shock prevention in it.

As he operates the surgeon has shock in mind as he prevents loss of blood, loses no time in his procedures, and seeks to injure as little as possible in what he does.

Then, the several precautions we take after operation for keeping the patient warm, for handling him gently, and many of the other things which are done to keep the patient as comfortable and contented as possible, including the drugs given for relief of pain and for inducing sleep, all play a part in minimizing the danger of shock.

Treatment of Shock. Since the several disorders in shock center about the circulatory system (low blood pressure and subnormal volume of blood) the first efforts of treatment, just as is done in the parallel condition of hemorrhage, will be directed toward keeping the vital areas--the head and trunk--as well served as possible with whatever circulation remains. Therefore the foot of the bed will be elevated, and perhaps the extremities and the abdomen will be bandaged, as described for hemorrhage, to discourage their circulation in favor of the other parts.

Heat to the body, which serves so well as a preventive of shock, is also one of the main reliances after it has occurred, and in addition to hot blankets, hot water bottles, and a well heated room, rectal instillations of hot saline may be given as will also hot drinks if the patient is able to take them.

Rest and quietness will be necessary of course, morphine being the standard drug for this, though as noted under symptoms of shock, nature usually provides quietness as a part of the condition.

For their effect of raising blood pressure ephedrine and epinephrine may be given.

When there has been hemorrhage transfusions of blood, or infusions, hypodermoclyses or proctoclyses of saline solution will be given to restore lost fluid and raise the blood pressure.

To compensate for the feebleness of the respirations and at the same time to stimulate them, oxygen and carbon dioxide gas may be administered, and sometimes artificial respiration will be employed.

Retention of Urine.

This is a condition in which the urine accumulates in the bladder without the occurrence of the normal reflex stimulation to void, so if untreated the process will persist to painful over-distention of the bladder with eventual involuntary and constant leakage of urine. Mechanical obstruction of the neck of the bladder or the urethra, as by a tumor, can cause the disorder, of course, but after operation it will usually be due to some interference of either the anesthetic or the operative measures with the nerve control of micturition. It occurs most frequently after pelvic and perineal operations but may follow almost any other one.

Treatment. If the simple nursing measures such as pouring warm water over the genitals, running water within the hearing of the patient, etc., do not correct the disorder, heat (flaxseed poultices, stupes, hot water bottle, etc.) to the pubic region, a small enema or a rectal irrigation may be ordered for its occasional effectiveness in such cases, and if such devices do not succeed catheterization will be prescribed. In cases where it will be necessary or important to prevent distention of the bladder, catheterization may be done fairly early (8 to 12 hours after operation) and it may then be ordered repeated at some such interval, but in other cases this is always objectionable and last resort of catheterization may be postponed for possibly as long as eighteen hours.

Anuria, or Suppression of Urine.

In this condition the kidneys have ceased to excrete urine. It occurs oftenest after kidney operations but may follow others too, especially if the kidneys were previously diseased. Unless it is corrected promptly it will result in uremia--a grave toxemia due to retention within the blood of the waste products normally carried off in the urine. At first it may be difficult to distinguish between anuria and retention without passage of the catheter, so this much more serious disorder must be kept in mind as a possibility in any case of inability to void urine.

Treatment. Immediate and vigorous efforts must be made to stimulate the kidneys to function again and meantime to induce other avenues of elimination to substitute as best they can for the disabled kidneys. Cupping and hot applications (poultices, etc.) to the lumbar region, and diuretic drugs such as caffeine and theobromine are likely treatments for stimulation of the kidneys, and for purposes of elimination there will be such treatments as hot packs, forced fluids, colon irrigations and purgation.

Abdominal Distention.

Following anesthesia and operation, especially after exposure and injury of the intestines in major abdominal cases, there may be undue delay in the return of peristalsis. Therefore various gases, some of which are naturally present to some extent, will accumulate and remain and so cause

within twenty-four hours or so an inflation of the stomach and intestines which is commonly called distention or more technically tympanites or meteorism.

Symptoms. The abdomen will be enlarged, of course, and more or less tense and tender. Pain, usually severe, will be cramp-like and intermittent as peristalsis begins to return, but when the paralysis is more serious and prolonged the pain will be more constant. As the distention increases there will be a distressing feeling of fullness and a pressure upward against the diaphragm which will impede respiration causing it to be rapid and shallow, and in extreme cases heart action may be so interfered with that the pulse will be weak and rapid. In the more persistent cases nausea and vomiting will be persistent also and any administration by mouth will only tend to aggravate the condition through the associated swallowing of air (itself a mixture of gases) and the irritation and the possibly gas-producing fermentation of the ingested substances.

Treatment. As is true of most disorders, the best treatment for distention is prophylaxis against it. Accordingly, the preoperative preparation given the gastro-intestinal tract is partially prophylactic against postoperative distention, and so are (to some extent) the several precautions as to drinking of water. Then a rectal tube inserted (to a distance of three or four inches) immediately after operation and left in place will continually release gas as it reaches the rectum, colon irrigations of salt solution or plain water will keep the colon free of obstruction and at the same time will be stimulating and will supply fluid which is so likely to be needed after any operation.

When distention has become established the rectal tube will still be helpful as will also the colon irrigations, and in this case heat to the abdomen in the form of flaxseed poultices, turpentine stupes, electric pad, etc., may be used at the same time for stimulation of peristalsis. Later on, especially if it is known or suspected that the intestinal canal is not empty, enemas, especially ones containing such carminative drugs as turpentine, peppermint, etc., may be given for the double purpose of cleansing and of stimulating peristalsis.

Usually distention can be so controlled by such measures that it will pass off by about the third day after operation, but an occasional persistent case will require resort to such drugs as pituitary and physostigmine for their stimulating effect upon the intestinal muscles.

In a few cases all treatment for distention will fail because the intestinal muscles will have become profoundly paralyzed. There will then exist a form of intestinal obstruction which will be discussed when we come to the surgery of the Digestive System.

Meantime, the nursing measure of changing the position of the patient from side to side at restfully frequent intervals (if permissible) will often go a long way toward both the prevention and the cure of intestinal stasis and this accompanying condition of distention.

Acute Dilatation of the Stomach.

This is a condition in which the muscular coat of the stomach has become paralyzed (and it may take place suddenly and rapidly) and so permits a rapid enlargement of the organ through the accumulation within it of gas and fluid which it is not able to pass onward. Also, because of its lack of tone it will permit regurgitation of bile and other contents from the duodenum.

Symptoms. The distention will cause an extremely distressing pressure upon the heart and lungs with the same rapid and shallow respirations and the weak and rapid pulse just mentioned as associated with the general abdominal distention. Also, these patients will be subject to stubborn and very wearing attacks of hiccough. Vomiting will be persistent and in extreme cases it will occur at very short intervals, a brownish or greenish colored fluid spilling over in small quantities and with little straining rather than being ejected in the more usual forceful way.

Treatment. The stomach tube will be the main reliance for coping, with the condition either in the usual way for frequent lavage or constantly for drainage by siphonage, the retained tube often being one of small caliber inserted through the nostril instead of the mouth. Administrations by mouth will be forbidden except that in some instances of the retained tube with constant siphonage water may be allowed freely to serve as a wash as well as for gratification of the extreme thirst which goes with the disease.

Also, lying upon the face with the foot of the bed elevated will sometimes be prescribed for these patients for the mechanical advantage thus obtained for emptying the stomach and so resting it and encouraging its recovery.

Stupes and poultices to the epigastrium will serve in this condition as they do in the general abdominal distention.

Patients who are losing so much fluid by vomiting will need to have it replaced, so salt solution will be given plentifully by rectum, intramuscularly, or intravenously, and glucose may be included with the intravenous injections for the nourishment which these patients will greatly need.

Disturbances of Metabolism.

As a result of one or more of the many possible interferences with the normal bodily processes which may be associated with anesthesia and operation the balance among the various complex chemical and physical processes (the metabolic processes) may be upset and so there may be several problems in metabolism to deal with from time to time as complications of surgery. The principal ones of these are dehydration and acidosis.

Dehydration. By this is meant the withdrawal of water from the tissues and the fluids of the body, as will take place when the intake of water fails to keep abreast of its elimination, the resulting condition being called anhydration. Thus dehydration takes place to a greater or lesser degree as a result of the necessary limitation of water, and of food with its water,

immediately preceding and following anesthesia and operation; of the intolerance of the stomach for food and water and the consequent vomiting after some of the anesthetics; of the sweating which so often accompanies and follows anesthesia and operation; of various conditions in which ingested water cannot reach the lower part of the intestinal tract where its principal absorption takes place, as in intestinal obstruction; and of undue evaporation from extensive open wounds or burns.

Because such tissues as the skin and muscles appear to give up their water before such vital parts as the brain and heart, the first symptoms of dehydration will be those of a dry and shriveled skin as will be evident in a drawn expression of the face with sunken eyes and cheeks. Later the blood surrenders water and so becomes reduced in volume, thus tending to lay the foundation for shock. Loss of weight naturally follows, the urine becomes scanty and highly colored, and fever may result eventually.

The treatment for dehydration is copious administration of fluids--orally, rectally, intramuscularly, intravenously. In the preparation for almost any important operation it will be anticipated in the routine attention to preoperative fluid intake and in the more threatening cases, or where it already exists, infusions will be given freely also during operations as well as after it.

Acidosis. This is the name given to a form of metabolic disturbance in which the acidity of the blood is increased. It may result from dehydration and starvation, chloroform and ether anesthesia seem responsible for some cases of it, and it is a common accompaniment of diabetes.

Its principal symptoms are dyspnea, anorexia, nausea and vomiting, lassitude, red and dry tongue, odor of acetone (sometimes described as "fruity") upon the breath, acetone and diacetic acid in the urine, fever perhaps, and in extreme cases it will go on to coma and death.

The treatment will vary with the cause, sodium bicarbonate solution being given rectally or intravenously to restore the alkaline balance, glucose intravenously in cases of undernourishment, and insulin will be a specific treatment in diabetic cases.

Peritonitis.

Inflammation of the peritoneum may develop after operation as a result of contamination either from without the wound or from the interior of the intestines, stomach, gall bladder, etc., the injury of exposing and handling of the peritoneum during operation often creating favorable conditions for bacterial activity. There are, however, many other aspects of the subject of peritonitis so its discussion belongs rather under abdominal conditions.

Intestinal Obstruction.

This is a condition in which the intestines have ceased to pass onward their contents. As already mentioned it may be an extreme development in abdominal distention, and it may become a postoperative complication in other ways, but similarly to peritonitis it occurs from various causes quite apart from the postoperative ones.

Wound Infection.

Occasionally through slip of technic or force of circumstance at some point in the long and complex course of surgical antisepsis and asepsis, which extends all the way from the suture material factory through the patient's room or ward and the processing departments of the operating room to the depths of the wound upon the operating table, an infection will occur in a wound which, by all the rules, was clean and should have healed normally. This will not occur often, but often enough, nor will it often be serious when it does happen but it may be serious unto death itself, so wound infection must always be kept in mind seriously as we observe the patient's symptoms from day to day after any operation.

The symptoms of infection in these supposedly clean wounds are most apt to appear two or three days after operation but in rare cases they may be delayed as long as two weeks.

One of the more common of these wound infections is the stitch abscess which is a comparatively minor infection about a skin suture as a result probably of incomplete preoperative sterilization of the skin or of contaminated suture material.

A wound suspected of infection will be examined at once with perhaps removal of a suture or two, an opening of the stitch abscess or any other, and possibly the insertion of a small drain.

Rupture of the Wound.

Sometimes, though not often, an abdominal wound will break open and permit the intestines to bulge through the opening--an occurrence called evisceration. Extreme distention and vigorous coughing may cause this by tearing the sutures and infection may do it by weakening them. The operation of resuturing the wound will be the only treatment for the accident, but it is a nursing matter in that it may often be prevented by faithful watchfulness over abdominal binders and strapping and by actual manual support to the abdomen during severe attacks of coughing.

Pneumonia.

This infection is a greatly to be feared postoperative complication because of both its comparative frequency of occurrence and its seriousness. A high temperature with rapid pulse and respiration, especially if preceded by a chill, will always raise the question of pneumonia in the first few days after operation even though such symptoms announce also any other kind of infection.

All along the course of preparation for operation, the operation itself and the aftercare, as has already been considerably emphasized, prophylaxis against pneumonia figures prominently, for the disease appears to have so many possible predisposing and exciting causes and there is usually no knowing where the greatest danger of it lurks. Thus a patient with a "cold" or bronchitis is not operated upon except in emergency and even then ether

will not be administered by inhalation because of its known irritative effect upon the respiratory tract; and almost any of the other pre-existing conditions unfavorable to operation, have the factor of predisposition to pneumonia in them through their adverse influence upon resistance in general. And the provisions against exposure to sudden and extreme changes of temperature taken in the operating room and everywhere else after operation are at least partially directed against postoperative pneumonia. Then, during operation within the mouth, nose, and throat aspiration of blood and other matter must be prevented, largely because of the danger of immediate asphyxiation, of course, but also because various bacteria (the pneumococcus often among them) habitually reside in these parts, and in any case even the slightest foreign object may create favorable conditions for infection; and sufficient has already been said about the danger of aspirated vomitus in this connection.

Then, the simple nursing measure of changing the position of the patient frequently in all permissible cases for the mere comfort and restfulness of it will at the same time be prophylactic against postoperative pneumonia in that insufficient aeration of the lungs as caused by cramped posture or by lying too long in one position may encourage bacterial activity.

Massive Collapse of the Lung.

This is a condition in which a portion or the whole of a lung is devoid of air and therefore collapsed. Though the cause of the disorder is not fully understood it is attributed to obstruction of a bronchus, possibly by inhaled substances, local secretions, products of infection, etc., which accumulated perhaps during anesthesia while the coughing reflex was paralyzed or afterward because of discouragement of the natural response of coughing by pain, tight dressings about the chest, the depressive effect of morphine, etc.

When only a small area of a lung is thus involved the term atelectasis will be used for the condition, and correspondingly the more extensive involvement may be termed massive atelectasis.

Pneumonia is quite prone to follow in the wake of this disorder.

Symptoms. The first warnings of the trouble may be complaint of the patient of a sensation of tightness in the chest and his inclination to lie drawn up on the affected side. Then will follow cyanosis, dyspnea with perhaps efforts to cough, rapid respirations and pulse, and fever, the patient often appearing profoundly ill.

Treatment. Dislodgement of the obstructing material will be the objective of the treatment, of course, and to this end the patient will be turned to lie on his other side or perhaps moved otherwise with a view to arousing the coughing reflex; efforts at forceful coughing will be urged; deep breathing will be stimulated by the administration of carbon dioxide gas; and occasionally the obstructing object can be seen through the bronchoscope and removed with instruments.

Thrombosis.

This is a process by which a clot of blood is formed upon the lining membrane—the endothelium—of a blood vessel. The clot itself is called a thrombus and it occurs in a vein much oftener than in an artery. Once started the thrombus usually extends (perhaps attached only at the starting point) by the addition to it of layer upon layer till it reaches a branch of the vessel, and it may so enlarge, of course, as entirely to occlude the vessel.

Causes. Like so many others of the postoperative complications, thrombosis occurs under many conditions other than postoperative ones, but injury to the vessel is one cause of it so it may result from the crushing incident to vessel ligation in the ordinary course of operation. Also, there is a type of postoperative thrombosis of which the cause is unknown. This occurs oftenest in the veins of the leg, is commoner in the left leg than the right, and follows abdominal and pelvic operations oftener than others.

Other causes are infection of the vein (phlebitis); a sluggish blood current, as may be the case in vessels shrunken by arteriosclerosis or compressed by tight bandages, etc.; changes in the blood itself which shorten its coagulation time, as may result from dehydration, toxemia, or drugs injected intravenously; and external violence which injures the vessel.

Symptoms. Pain and tenderness of the part affected will be the first symptoms of a serious thrombosis, and in the case of the leg, where post-operative thrombosis is most likely to occur, the foot and leg may later become swollen, edematous and numb. When an important artery is thrombosed nourishment of the part supplied by it will be diminished or even blocked entirely and therefore gangrene will result, as in the foot and leg, the hand and arm, or almost any other part. If the thrombus is due to infection or if it becomes infected later, an abscess will form at the site of it and various symptoms of infection, of course, will then follow.

Treatment. Absolute rest and quietness of the part is the first and most important treatment for thrombosis, and in the case of the leg it will be kept elevated, a splint will sometimes be applied, and the comfort of the patient will call for the nursing care of keeping the weight of the bed covers from the tender part by means of the bed cradle. Heat in the form of hot compresses, the electric pad or lamp, or cold applications, and sometimes soothing lotions will be used for the relief of pain.

For reasons which will appear presently, the treatment of quietness for the afflicted part may be necessary for as long as a month or more even though pain and all other symptoms may have disappeared.

In some instances a thrombus can be removed by surgery—an operation called thrombectomy.

Phlebitis.

This condition of inflammation of the wall of a vein occurs oftenest postoperatively in the legs (most frequently in the left) and is most apt to appear after abdominal and pelvic operations. It is one of the causes of thrombosis, and when thrombosis does develop with it the more specific term thrombophlebitis is used for the condition.

Symptoms. Early signs of phlebitis will be pain, sometimes occurring suddenly, and a rise in temperature which may be accompanied by chills. Swelling and tenderness over the infected vein and sometimes of the whole leg will follow, and edema may be present. In some types of the disease the skin along the line of the vessel will become reddened, and in others the entire leg will appear blanched. And in addition to the pain the patient's sensations in the part will be those of stiffness and heaviness. As in any infection, suppuration with its various symptoms may develop in phlebitis.

Treatment. The nursing care for phlebitis will be essentially the same as that given above for thrombosis.

Embolism.

Portions of a thrombus, as well as other bodies (enumerated in the next paragraph) may join the blood stream and so be carried to distant parts of the body where they will lodge in, and obstruct the first vessel which is too small to pass them. This process is called embolism and the object thus carried and deposited is an embolus.

In addition to thrombi the source of emboli may be new growths of the interior of vessels or of a valve of the heart; bacteria from some focus of suppuration; particles of fluid fat (fat embolus) believed to be released, for the most part, from the bone marrow in fractures or in bone surgery; and air (air embolus) accidentally gaining entrance through large severed veins, especially those near the heart, as at the base of the neck or in the pleural cavity.

In this connection should be recalled the spread of malignant tumors by metastasis and metastatic infection, for it is through this process of embolism that such metastases are effected.

At least in the case of thrombosis, movement of the part, especially if sudden, may cause an embolus to break away, hence the treatment of quietness for so long a period after symptoms have passed away (as given for thrombosis) the object of it being to allow time for development of the thrombus into some form of permanent organization and attachment.

Consequences of Embolism. Varying with such factors as the point of origin, composition, size, and point of impaction of an embolus, the several consequences of embolism will differ widely, as follows:

A small and aseptic embolus lodging in a minor vessel, even of such an important organ as the lung or kidney, may be practically inconsequential

except that in the case of a terminal artery it may cause a small area of necrosis--called an infarct.

An embolus bearing bacteria, however, whatever its size, will probably cause infection wherever it comes to rest, and one composed of malignant tumor cells will almost certainly found a new malignant tumor.

A large embolus originating in a large vein of the leg may find its way to the pulmonary artery or one of its main branches and by blocking it--pulmonary embolism--cause sudden death. Or, if it is small enough to pass onward to a smaller branch and lodge there it will cause sudden pain in the chest, dyspnea, cyanosis, rapid respiration and pulse, general depression, cough with bloody sputum, and perhaps a moderate elevation of temperature. With such treatments as morphine for pain, oxygen for dyspnea and cyanosis, perhaps heart stimulants, and good nursing as to comfortable posture for breathing (perhaps partially sitting) patients with this type of embolism have a good chance for recovery, though there is always the danger that pneumonia or other emboli will follow.

Like thrombosis, embolism may result in gangrene if the embolus lodges in the main artery of a part, as of the leg or arm, and amputation will then be the only treatment.

In the cases of fat embolism the emboli find their way oftenest to the small vessels of the lungs, though they may lodge also in the brain and elsewhere. In the case of the lung they cause dyspnea, cyanosis, cough with sputum containing fat and possibly blood, weak pulse, low blood pressure, and great depression in general. In fat embolism of the brain delirium, convulsions, coma, and usually death result in rapid succession. The kidneys eliminate the fat and so in all cases it will appear early in the urine and will often be visible to the naked eye as globules floating upon the surface of the urine. Since elimination of the fat takes place naturally, treatment will be for symptoms as they arise.

Air embolism will occur during operation as an instant result of a very large volume of air being sucked into an open vein of the region of the neck or in the pleural cavity and thence being forced along to the heart where it mixes with the blood and reduces it to a frothy state and so prevents proper functioning of the heart. Dyspnea, weak and rapid or imperceptible pulse, pallor, and perhaps unconsciousness occur at once, and death usually follows in a few minutes, though recovery does sometimes occur. However, air embolism is a rare accident.

Like a thrombus, an embolus may sometimes be located and removed surgically, the operation being called embolectomy.

Chapter XII

OXYGEN THERAPY EQUIPMENT

Directions for Operation

Model O Hi-Co Oxygen Therapy Equipment may be employed for the administration of Oxygen alone or for the administration of mixtures of Helium 80% and Oxygen 20%. The flowmeter is calibrated for both types of administration, on the left side of the flowmeter being the calibrations for the Mixture while those on the right side are for Oxygen alone.

Before attaching the regulator to the cylinder, it is well to open the cylinder valve for an instant so as to blow out any dust, dirt or foreign particles which may have collected in the valve orifice. The connecting nut on the regulator is threaded for use with Styles "F", "M" and "G" cylinders regularly used for Medical gases. When employed for the administration of Helium 80% and Oxygen 20%, or Oxygen alone, in cylinders used exclusively for Medical purposes, be sure that a single washer is placed in the connection. When used for Oxygen therapy with Industrial Oxygen cylinders, the adaptor will be required to fit this regulator to the Industrial cylinder valve. In attaching the regulator assembly, the connecting nut should be tightened until no leakage occurs at the point of connection. The regulator is set at the factory and required no adjustment at any time.

The water jar can be any jar with a capacity of not less than 500 cc. (approximately 1 pint). This jar is equiped with a rubber stopper having two holes into which are inserted two glass tubes. One glass tube is to be completely submerged in the water, the other tube must be free from the water. Fill the jar approximately three fourths full.

Next, open needle valve outlet on flowmeter. Then open cylinder valve fully, after which the needle valve should be closed. Tank pressure is automatically reduced so that the flow of gas is easily controlled by the needle valve on the outlet. This valve regulates the volume of gas delivered to the patient. The flowmeter is graduated so as to permit sufficient flow under all conditions.

To the outlet on the back of the flowmeter is attached the rubber tube leading to the water jar. The Oxygen passes through a reducing valve and flowmeter, enters the rubber tube and is delivered into the water jar. The Oxygen passes from the jar through the rubber tube connected to the mask, enters the inlet and is delivered through a tube into the lower end of the reservoir rebreathing bag. It passes up into the nose chamber and is inhaled by the patient.

The exhaled gases pass down through the tube and into the bag. When the bag becomes distended with the mixture of expired air and incoming gas, the slight pressure thus produced causes the remaining portion of the exhaled gases to pass out through the inhaling-exhaling valve. The valve proper consists of a finely-grained sponge rubber disc inserted in a turret or holder molded into the down tube of the mask. The expired air escaping through the inhaling-exhaling valve will be from the latter part of the expiration and will contain the most Carbon Dioxid and the least Oxygen or Helium-Oxygen Mixture.

FOR OXYGEN THERAPY

The following rates of flow will provide the patient using the B-L-B Inhalation Apparatus with the following percentages of Oxygen in the inspired air. (The corresponding percentage for alveolar air will be approximately 7 percentage points lower).

Liters per Minute O_2	Small Person (per cent) (1 hole open)	Medium-sized Person (per cent) (2 holes open)	Large Person (per cent) (3 holes open)
3	45 - 60	40 - 55	35 - 50
4	60 - 75	55 - 70	50 - 65
5	75 - 90	70 - 80	65 - 75
6	90 - 100	80 - 90	75 - 85
7		90 - 100	85 - 92
8			92 - 100

One, two and occasionally for short periods, four additional liters should be used for patients who for any reason have an abnormally large respiratory volume, or if the nasal mask is being used and the mouth is partly open with the patient inspiring part of the air through his mouth. If the nose is obstructed, the oronasal and not the nasal mask should be used.

STERILIZATION

The B-L-B Inhalation Apparatus can be satisfactorily sterilized by boiling for three minutes and rinsing thoroughly.

THE HEIDBRINK PORTABLE OXYGEN TENT

Models 55, 56, 57.

Directions

The apparatus as shipped from the factory (collapsed) requires no assembling except to attach the regulator to the tank, hang the drain pail on the ice chest, and with the Model 57 attach the carbon dioxid attachment if one is included.

TO ATTACH REGULATOR

Attach the regulator tightly to the threaded outlet of the valve of a commercial tank of oxygen, using a wrench. For medical oxygen tanks an adapter is supplied.

Attach the rubber tubing from the bottom outlet of the regulator to the bottom connection on the flowmeter. The flowmeter is calibrated in terms of O_2 liters per minute flow.

Attach the rubber tubing from the flush-valve on the back of the regulator, to the metal tubing outlet on the side of the ice-chest nearest the tent hood. The emergency volume from the flush-valve then goes direct through this tubing into the ice-chest. The measured flow of oxygen as indicated by the flowmeter is conducted from the outlet at the rear of the flowmeter to the ice-chest by a short tubing which is attached at the factory.

THE MOTOR-BLOWER

Circulation of tent-air through the ice-chamber is produced by the motor-blower which is turned on and off and regulated in speed by rheostatic control. Low, intermediate, high, and off positions are indicated on the rheostat. Rheostat operation requires that its adjustment knob be turned from "off" to "high" and thence toward "low".

THE DAMPER

The damper is adjustable and it is operated by the push-rod on the ice-box. Pulling out the rod closes the damper and thus greatly reduces circulation volume and cooling.

The damper should be left wide open except when slowest motor-blower speed obtainable by rheostatic control still produces more cooling than is desired. Then only should damper rod be pulled out to the extent necessary to secure the desired result.

HEIGHT ADJUSTMENT OF HOOD

To raise or lower the ice-chest (and hood) of the Model 55 while the apparatus is applied to the patient, attach the ratchet wrench to the top of the elevating screw and turn it until the hood height is as desired.

If the hood height has been adjusted and tucked in to accommodate a patient in inclined position, and it is desired to lay the patient in prone position, always lower the hood first. This prevents strain on the hood fabric, suspension brackets and hood-support-rod.

The ratchet wrench may be hung on the hook on the back of the ice-chest when not being used.

Models No. 56 and No. 57 are equipped with a built-in crank for adjusting the height of the ice-chest and hood.

HOOD TILTING DEVICE

The bracket which holds the horizontal hood-support-rod is hinged, and has a handle (with chain-hook) which when pulled down and hooked to the bail of the ice-chest cover, tilts up and retains the hood tilted, which facilitates placing it in proper position over the patient. If the hood skirt at the end opposite the ice-chest is first raised and suspended from the spring hanger by means of the two eyelets at the bottom of the skirt, no assistant is required to lift the skirt over the patient, and the operator has the advantage of being able to see the patient through the two small windows at the end of the hood nearest the ice-chest and be thus enabled to place the hood squarely in the proper position.

DRAIN AND DRAIN PAIL

End supports at the bottom of the ice-chest retain the drain pail under the drain while the apparatus is in operation. If pail so hung interferes with tent-hood adjustment to very low beds, place it on the floor under the drain.

The drain-trap is unique in that when it is tipped and emptied just prior to removal of the drain pail, the trap will catch and hold the drippings during the brief time required to empty the pail. Meanwhile the trap always contains enough water to prevent escape of tent air. The trap is easily removable which facilitates cleaning the drain.

SODA LIME BASKET

The soda lime basket (located in the separate end compartment of the ice-chest) is easily removable for filling, emptying and cleaning. Be careful to properly replace the compartment cover and lock it to place to prevent leakage.

PREPARATION FOR USE

Upon removal of the apparatus from the packing case first raise the ice-chest to approximately its highest position to keep the hood skirt off floor when it is released from the hangers.

Next hang the drain pail on the ice-chest.

Fill the ice compartment of the ice-chest approximately full with cracked ice (3" to 6" chunks last longer than smaller pieces). See that no ice gets into the end compartment which contains the blower mechanism.

From the end compartment of the ice-chest remove the soda lime basket, fill it with 4-8 mesh soda lime, and replace the basket.

Now lower the hood skirt by removing eyelets from hangers, and unsnap the fasteners at the bottom of the skirt.

Next raise hood-support-rod to horizontal position and push it back into its support bracket until it locks in horizontal position.

Extend the hood to full size by sliding the outside and middle hangers along the horizontal support rod until the outside hanger is between the two pegs near the end of the rod, the middle hanger is beyond the central peg, and the remaining hanger is behind the peg nearest the support bracket. Thus adjusted there is no "pull" on the hood fabric where it is attached to the ice-chamber (whereas there will be if the hanger nearest the ice-chest is placed in front of the peg which is nearest the support bracket).

For a 36" or narrower bed, the outside hanger needs to be slid along the horizontal rod only to beyond the single pin nearest the two end pins, and the hanger nearest the ice-chest should remain behind the hood on top of the hinged bracket that holds the horizontal hood-support-rod.

Again suspend the end of the hood skirt farthest from the ice-chest on the hanger at the outer end of the hood-support-rod and with hood tilted up wheel the apparatus into position so that the hood is over the patient; then lower hood to horizontal, and adjust height of hood to suit. (Remove drain pail while adjusting height of hood).

OXYGEN ADMINISTRATION SHOULD NOW START PROMPTLY

Connect motor to electric current and start the motor blower by turning the knob of the rheostat until the white arrow points to "3" or "4". This produces sufficient circulation to maintain the average patient in a comfortably cool atmosphere. Later adjust the circulation and cooling to suit requirements. The patient's comfort is usually an excellent guide.

Should the operator desire hood temperature readings, a thermometer may be suspended from the loop provided inside the hood above the end windows opposite the ice-chest. On the Model 57 an armoured thermometer permanently attached to the outlet connection from the hood to the ice-chest is standard equipment.

Now remove the hood skirt from the end hanger and tuck entire skirt in tightly all around. Tuck it well under the mattress or bed pad at the sides and back of the patient. Tuck it under the hips of the patient. A draw sheet placed across the pelvis and tucked under the mattress tightly at both sides will help to keep the skirt of the hood in place.

Immediately open the oxygen tank valve and open the oxygen regulator valve (stamped "ON" and "OFF") until 6 liters flow per minute is registered by the flowmeter.

Then flush the hood with oxygen for one minute by pressing open the emergency valve on the back of the oxygen regulator.

Whether or not 6 liters continuous oxygen flow per minute as now being delivered by the apparatus is too much or too little to maintain the proper concentration, depends largely on how well the patient is tucked in, on the condition of the hood (re. tears, holes, etc.) and on whether or not a rubber sheet has been spread under the mattress or bed pad. Analysis will disclose whether the oxygen supply should be increased or decreased.

Analysis should be made at the end of 30 minutes to determine the oxygen and carbon dioxid content. Authorities recommend that the oxygen concentration be usually maintained about 50%, that it should never exceed 70%, and that the carbon dioxid content should not exceed 1½%.

Samples for analysis may be drawn off through the metal tube at the top of the hood. (Don't forget to replace the rubber seal on tube).

Tent air should be analyzed for oxygen content at regular intervals at least three times daily and the results recorded on the patient's temperature chart,--and for carbon dioxid content less frequently. Analysis for both should be made more frequently if less than six liters per minute of oxygen

is used, and when the tent is being operated by inexperienced persons.

By means of the small ball-chain behind the ice-chest of the Model 55 the circulation volume may be deflected upward at various angles and away from the patient. On Models 56 and 57 the deflector is adjusted by hand within the tent-hood.

The more tightly the atmosphere is confined in the circulation system the greater will be the increase of carbon dioxid, and consequently the need of soda lime for its absorption. Leakages which necessitate a greater oxygen supply also permit greater carbon dioxid "washout".

The use of soda lime (for absorption of carbon dioxid) or its discontinuance, as indicated by analysis, is accomplished by insertion or removal of the basket containing the soda lime from its compartment in the ice-chest.

While removing or replacing the soda lime basket, momentarily shut off the motor-blower. This prevents loss of oxygenated air. Don't forget to turn the motor-blower on again.

A filling of soda lime should last from 15 to 25 hours of continuous use depending upon the amount of carbon dioxid being thrown off by the patient. The loss of efficiency of the soda lime is indicated by an increase in the carbon dioxid concentration in the hood to beyond the desired limit when the apparatus has been operating with the soda lime.

When filling the ice-chest while the hood is applied to the patient, (pull the damper all the way out) until the ice-box cover is again locked on. Don't forget to again (push in the damper).

A filling of the ice-chest should last from 8 to 12 hours, depending on room temperature, rate of circulation, etc.

Sleeves are provided on the hood through which water, food, clinical thermometer, etc., may be passed to the patient without disturbing the "tucking in," and with minimum loss of cooling and oxygen. When not in use the sleeves should be folded back on themselves and held thus with clips. While the arm is inserted the sleeves should be held closed (around the arm) with the other hand.

When it is necessary to remove the hood to bathe or otherwise care for the patient, economy demands that the oxygen and motor-blower be shut off; and that the interruption of treatment be brief. Two nurses should work together. One should tilt up the hood and gather in its skirt while the other takes care of the patient. When the hood is replaced and oxygen delivery is resumed, again flush the hood with oxygen to quickly build up the concentration and immediately turn on the motor-blower.

Oxygen therapy may be continued for as long as is necessary to meet the requirements of the case.

CARE OF APPARATUS

After every case the tent hood should be washed on the inside with a warm (not hot) odorless antiseptic solution--allowed to stand fully extended

until dry--and then dusted with talcum powder. It then may be collapsed for storage.

Also the ice-chest should be emptied and rinsed with an odorless antiseptic solution and allowed to stand with its cover off until dry. The drain must always be kept free of obstruction.

If an oxygen regulator valve needs replacing, first shut off the tank valve. Then remove the hexagonal nut (with gasket) at the end of the valve chamber at the rear of the regulator, remove the spring, and then pull out the worn valve.

The nozzle against which the valve seats is then disclosed. Swab it off (also the valve chamber) with a cloth. Then insert the new valve, then the spring, and lastly, screw the nut in tightly against its gasket. An extra valve for use in emergency will be found in the compartment containing the blower.

The screen in the end of the union stud of the oxygen regulator should be kept clean. It may be easily removed by unscrewing it. (Use the eraser end of a lead pencil in the same manner in which one would use a screw driver.) USE NO OIL OR LUBRICANT.

Maintain the hood in good repair. Leakages increase operating costs.

The motor should be oiled after each 1000 hours of operation. An oil cup will be found at each end of the motor shaft.

Examine motor brushes occasionally and replace when worn out. When replacing brushes be sure end groove of brush is parallel to motor shaft. Extra brushes are furnished with the outfit.

The hood supporting assembly of the apparatus (including hood) can be removed intact. To do this, remove the corrugated rubber connecting tubes from the flanged metal connections on the ice-chest, remove small ball-chain behind the ice-chest from its "fork," and lift vertical hood-support-rod out of its socket.

ANALYSIS APPARATUS FOR OXYGEN AND CARBON DIOXID
DIRECTIONS FOR USE
SPECIAL ARMY MODEL

The Apparatus

The apparatus consists of two U tubes mounted on opposite sides of a supporting board or rack. The U tube on one side is for the analysis of the Carbon Dioxid content and the U tube on the other side is for analysis of the Oxygen content. The U tubes are alike and have identical rubber stoppers with glass tubing inserts. A removable glass syringe is mounted on one side of the board.

Fill one of the U tubes to the "level" etched on one of its arms with a 10% potassium hydroxide solution and it is ready for the analysis of the Carbon Dioxid content of the sample used. Place the roll of copper in the arm of the other U tube which is under the syringe clamp and fill it to the "level" etched on one of its arms with a mixture of equal parts of sixty per cent (60%) ammonium chloride solution and concentrated ammonium hydroxide and it is ready for the analysis of the Oxygen content of the same sample. Care should be taken that both U tubes are filled exactly to the level mark provided. (The chemicals above mentioned are not furnished as part of the equipment.)

Each arm of the U tubes is fitted with a rubber stopper, into which has been inserted a small glass tube. When the apparatus is not in use, the length of rubber tubing provided should be kept connected between these two small glass tubes to exclude air.

Solutions should be changed and mixing chambers thoroughly washed out each three to six months, depending upon the number of times the equipment is used. The syringe should be emptied of solution when each test has been completed. Analysis for both Carbon Dioxid and Oxygen can be made from a single syringe of air from the tent hood.

TO MAKE ANALYSIS

Remove rubber cap from metal "sampling" vent on top of the tent hood and attach short rubber tubing supplied (separately) with the Analysis Outfit. Insert the tip of the syringe with the plunger depressed into this rubber tubing and retract the plunger until a syringe-full of tent-air has been taken from the hood. Now depress the plunger and discharge contents back into the hood. Repeat this operation twice to be sure that no outside air remains in the syringe. Now take a third sample. With the plunger held carefully in the retracted position at a point just beyond the zero mark, remove the syringe from the analysis vent tubing on the hood and close that vent. Remove the rubber connecting tubing from the glass connector inserted in the stopper in the U tube arm (for Carbon Dioxid) farthest from the syringe clamp. Depress the plunger of the syringe to zero and carefully insert its tip in the open end of this rubber tubing. Inject the contents into the U tube. This will displace the solution in that arm and will cause a corresponding rise of the solution in the opposite arm. Place syringe in clamp above U tube and maintain this position for one minute; then retract the syringe plunger until the fluid in the U tube returns to the "level" mark.

The position of the plunger in the syringe will indicate the percentage of Carbon Dioxid in the tent air.

In order to insure accurate readings, it is suggested that the above procedure be repeated until two corresponding readings are obtained.

After the reading for Carbon Dioxid has been obtained remove the rubber tubing from the glass connector in the stopper which is in the end of the arm (of the U tube on the opposite side of the board) not containing the copper roll. Without changing the position of the plunger, quickly release the syringe tip from the rubber tubing of the Carbon Dioxid U tube and attach it to the now free end of the rubber tubing of the Oxygen U tube on the opposite side of the board. Inject the remaining air in the syringe into this U tube. Maintain this position for two minutes and retract the plunger until the fluid in the U tube returns to the level mark. Note the percentage indicated on the syringe at the bottom of the plunger. Subtract from this percentage the percentage that was originally obtained for Carbon Dioxid. The result will be the Oxygen percentage.

For example:- If the first reading of the syringe was 2%, and the final reading 52%, the 2% would indicate the Carbon Dioxid content of the hood and the difference between 2% and 52%, or 50%, would be the Oxygen percentage.

We believe that more accurate results can be obtained if two separate samples are taken for the analysis of each gas. As an example:- First take a sample of the gas from the tent atmosphere, and analyze this sample as previously explained for Carbon Dioxid. Then take another sample from tent and pass this gas into the ammonium solution containing the copper screen. This solution will absorb both Carbon Dioxid and Oxygen. Subtract the Carbon Dioxid absorbed by the caustic solution from the per cent absorbed by the ammonium solution to obtain the Oxygen per cent, i.e., 2% Carbon Dioxid caustic absorbed, 52% Carbon Dioxid - Oxygen ammonium solution absorbed, difference 50% oxygen.